ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

MAY 1951

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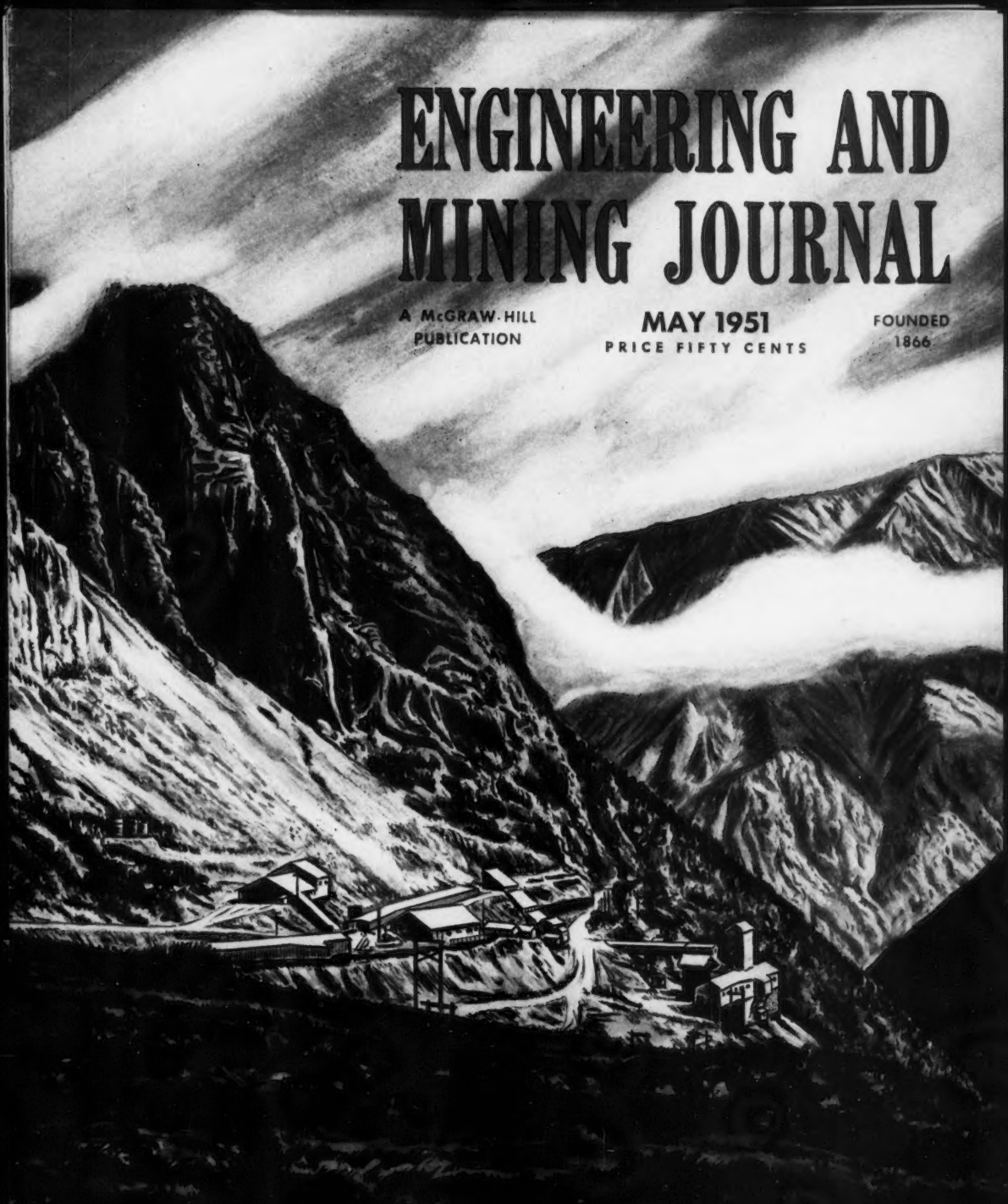
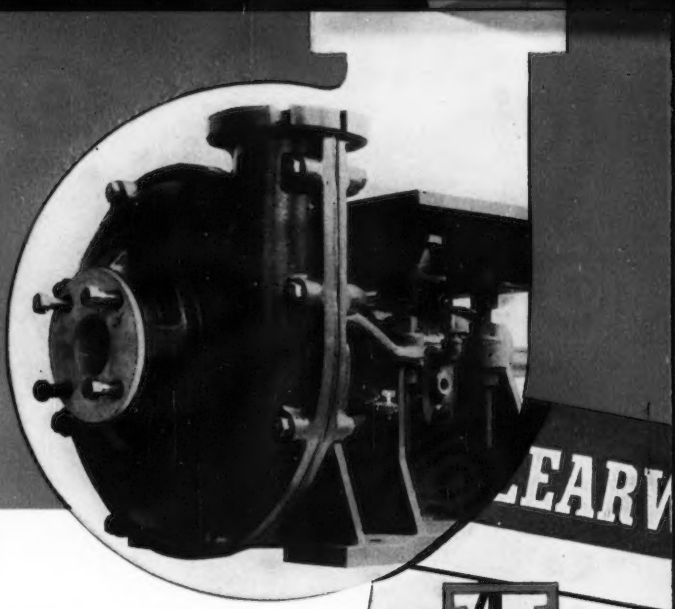


• Boosting Tungsten Output At U.S.-V.I.'s Mountain-Top Atlas, No. 1 U.S. Producer, Moves Above . . . P. 76

• When You Can Look For Trim From Washington . . . P. 72

This new size may fit your "in-between" pumping need



Need a pump with maximum performance in the 75 to 300 G.P.M. range, with heads up to 70 feet? Our new AB-Frame Hydroseal may be just the thing you've been looking for . . . Using a three-inch suction and discharge, it has the same million-ton-plus endurance and maintained efficiency of the rest of the Hydroseal line—the pumps that mill engineers swear by—not at!

No substitute for the right size

If you've ever tried to break in a new pair of shoes that didn't fit, you know how important it is to get the proper size. Pumps don't develop corns, of course, but they can cost you plenty in down-time, excessive wear, and power if they can't do their job efficiently.

You can be sure of getting a custom-built solids-handling pump at ready-made prices if you specify Hydroseals, regardless of your head capacity requirements. From slurries to six-inch boulders, there's a Hydroseal that's made to fit the job. Let us tell you more about this complete line of solids-handling pumps . . . Write or use the coupon.

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FOR YOUR CONVENIENCE

The Allen-Sherman-Hoff Pump Co., 229 South 15th St., Philadelphia 2, Pennsylvania
Please send me a copy of your new Hydroseal Pump Catalog No. 451.

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Position _____
Company _____
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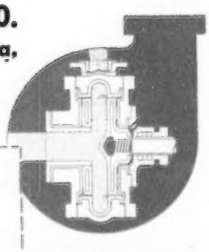
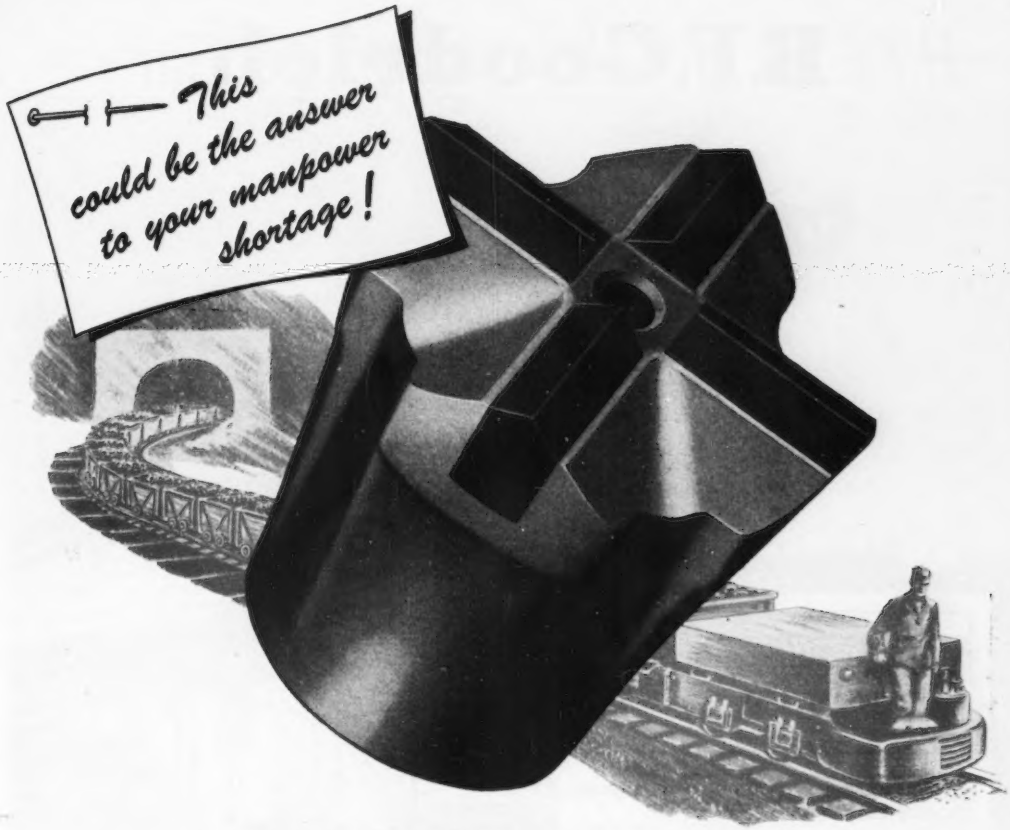


A handbook on efficient materials pumping

HYDROSEAL

SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD



Carset Jackbits enable you to

INCREASE PRODUCTION 20% OR MORE

... without increasing your drilling crews!

Carset Jackbits *DRILL 50% FASTER* (or more)—maintain uniformly high drilling speed for the full depth of the hole. This means more work from less equipment and fewer men.

Carset Jackbits enable you to pull *LONGER ROUNDS*—because even after long usage they show negligible gauge wear.

Carset Jackbits practically *ELIMINATE BIT CHANGES*. Holes can be bottomed faster. The need for Nippers is greatly reduced.

Carset Jackbits require *LESS MAINTENANCE*—need only an occasional touch up on a hand or power grinder, thus releasing additional manpower for productive work.

These advantages of the Ingersoll-Rand Carset Jackbit add up to *MORE TONNAGE* of rock or ore broken per shift. Many users report increases up to 50%—with *no increase* in the drilling crew.

Ask for complete information on Ingersoll-Rand's longer-lasting, faster-drilling Carset Jackbits. Bulletin No. 4104.

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SET WITH CARBOLOY INSERTS

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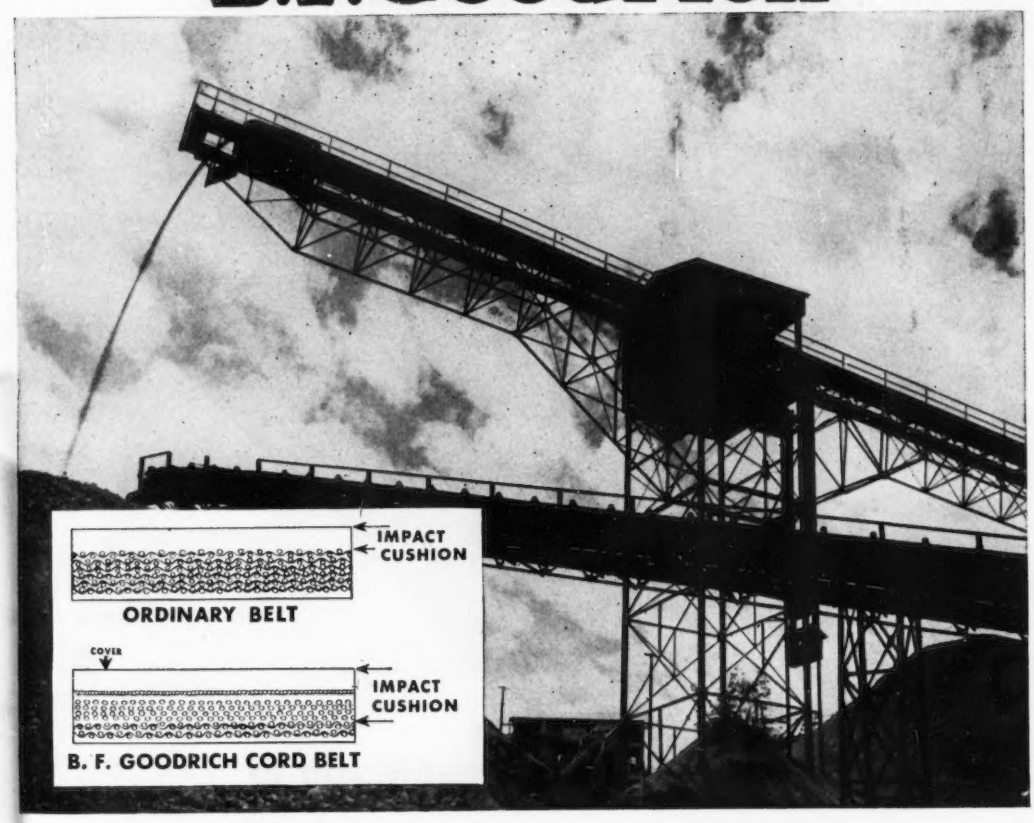
ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL & GAS ENGINES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Cord belt for tough jobs, longer centers, higher lifts

Gives 2 to 6 times greater impact resistance

WHERE you have heavy impact, long centers, high lifts, there's a special belt for your installation — the B. F. Goodrich cord conveyor belt:

Cord belt stands more impact — Each lengthwise cord in a B. F. Goodrich cord belt is completely surrounded by rubber — no cross threads tie them together. Cords are free to "give" when impact occurs. Rubber distorts temporarily, distributing and absorbing a shock that would damage stiff, unyielding plies. As an extra protection, B. F. Goodrich has added a patented *Transcord Breaker* — an extra layer of parallel cords in rubber, placed across belt width. Acts as a shock absorber, stretches to prevent gouges and cuts from splitting belt cover.

Cord belt troughs better — There being no crossweave in the cord plies, cords are free to flex. Belt conforms to idlers, pulleys. Spillage is reduced, troughing is natural and belt keeps centered on idlers, sustains less damage, requires less maintenance. Longer centers, higher lifts can be used.

Cord belt at work — A B. F. Goodrich cord belt at this rock plant travels from pit to crusher under a highway and two sets of tracks, yet delivers 1,000 tons of rock and sand an hour without spillage.

The first B. F. Goodrich cord belt ever made is still on the job after 12 years and 14 million tons of rough-riding coal. If rock, coal, sand, gravel, ore or any other material rough-rides your conveyor, you can save money by calling in your local BFG distributor. *The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.*

Conveyor Belts BY
B.F.Goodrich
RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

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Load your "guns" with TEXACO OLYMPIAN GREASE

More copper mining equipment in the U. S. is lubricated with TEXACO than with any other brand

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TEXACO STAR THEATER
starring
MILTON BERLE
on television
every Tuesday night.
See newspaper for
time and station.

TEXACO

TEXACO

WHEN *Texaco Olympian Grease* goes into car wheel bearings—plain, cavity hub or anti-friction—you can be sure of easier starts and lower bearing maintenance costs the year 'round. And these are the reasons why—

Texaco Olympian Grease stays *in* the bearings to give longer lasting, more effective protection. It seals out dirt and moisture . . . resists oxidation and separation both in service and in storage . . . reduces wear. You can get *Texaco Olympian Grease* in three consistencies to meet all your requirements.

To reduce maintenance costs of *open gears* and *wire rope,* use *Texaco Craters.* On gears, use *Texaco Crater X Fluid.* It goes on as a liquid, stays on as a tough, long-lasting, wear-reducing film. On wire rope, use *Texaco Crater A.* It keeps rope strong longer by protecting both strands and core.

Let a Texaco Lubrication Engineer give you full details . . . and help you simplify lubrication and reduce costs throughout your mine. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

Lubricants and Fuels

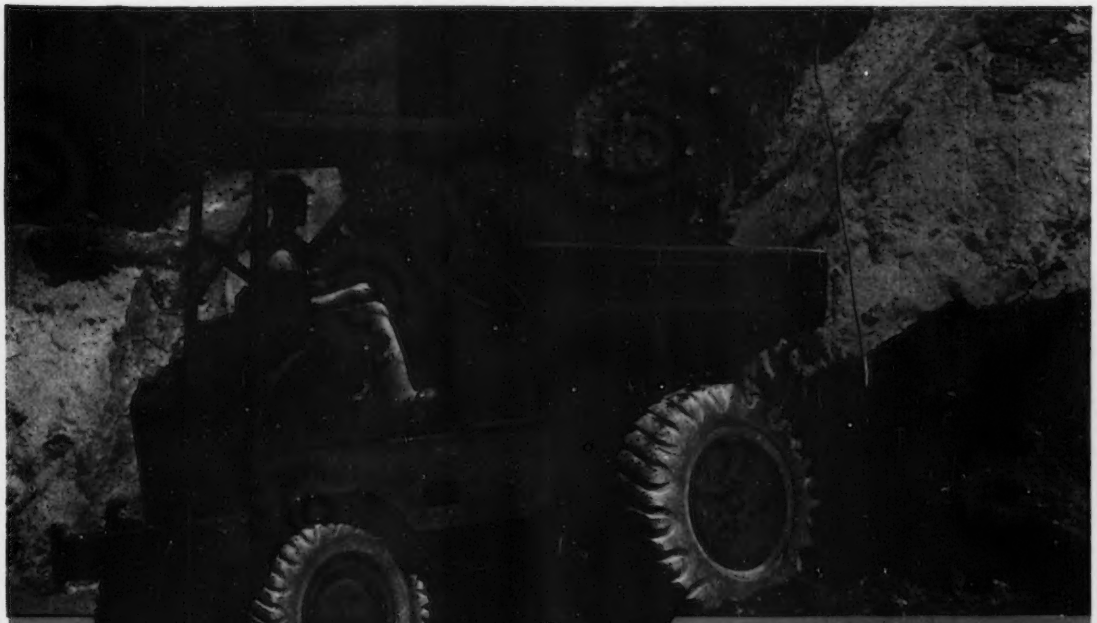
FOR THE MINING INDUSTRY

Top hauling efficiency with Dumptors also means increased shovel output. For consistent savings on excavating, check Koehring 4 heavy-duty models, ½ to 2½-yd. dipper capacities, 23½ to 79½ tons lift capacities. Models below 1½-yd. dipper

A TON OF DUMPTOR STRENGTH.

FAST, EASY SPOTTING . . . In confined underground operation, Dumptors spot fast, close to shovel . . . no need to turn. Big flared 8' x 8' body permits loading over end or sides. Shovel operator has easy-to-hit target, less spillage, short swing.

NO-TURN SHUTTLE HAUL . . . Dumptors travel same speed forward and reverse . . . save slow jockeying back and forth at the loading unit, on the haul, at the dump. Yet, Dumptors have plenty of maneuverability . . . turn in a tight circle of 19'-6" radius.



. . for every ton of payload

TO stand up under the most severe loading shocks of mine, quarry and construction service, Koehring Dumptors have more than a ton of net vehicle weight for every ton of payload. Sides, end and bottom of all-welded 6-yard body are heavily reinforced with 4" channel ribs. More than triple strength built into the bottom cushions shocks of rock loading. Seasoned 1⅝" oak timbers are securely bolted between two layers of 5/16" steel plate. Free-swinging kick-out pan adds another tough 3/16" high-manganese steel plate to Dumptor bottom for extra protection.

To withstand punishment of rough, off-road hauling, there's plenty of strength, too, in the heavy-duty chassis. Dumptor has rugged main frame of 8" ship channels, heavily trussed . . . 1-piece steel drive-axle housing and transmission case . . . 4" chrome steel drive axles . . . cast alloy steel "I" beam steering axle. There are no leaf springs . . . just one big, double-coil chassis spring on steering axle . . . none on drive axle. Big, shock-absorbing drive tires eliminate need for more. That means no spring maintenance.

For fast acceleration, less shifting, more grade-ability, Dumptors also have 6 HP for every ton of gross weight . . . climb grades up to 24% fully loaded. Learn, too, how 1-second gravity dump eliminates body hoist maintenance . . . saves 15 to 25 seconds on every cycle with Dumptors. Get all the facts from your Koehring distributor.

KOEHRING Company
Milwaukee 16, Wis. K126

KOEHRING (K) **DUMPTOR®**

WHAT OTHER
GIVES YOU ALL THESE

1. High Strength per Pound of Metal Used

The *Superior* crusher has been designed by Allis-Chalmers to take advantage of the latest engineering practices, modern materials and manufacturing methods. Cast steel instead of cast iron construction makes the entire crusher highly resistant to shock. Integrally cast reinforcing rings on top and bottom shell provide high strength with an economical use of metal.

Cast steel spider arms are of box construction . . . offer greatest strength and least interference for feed. Spider is fully protected by rim and arm liners. Mainshaft is annealed forged steel. Concaves are manganese steel. The eccentric has a replaceable bronze inner sleeve and bottom shell bushing. Bevel gear and pinion are heat treated steel with spiral cut teeth.

2. High Capacity per Pound of Metal Used

As high as 3040 tons of stone or ore per hour can be crushed in the 60-89 *Superior* crusher (60-in. receiving opening). High capacity design includes: straight down discharge, eliminating need for diaphragm . . . a countershaft that runs at available motor speeds . . . a deep crushing chamber that is the result of over a half century of experience in building gyratory crushers.

The shape of this scientifically designed curved crushing chamber offers a broad area of breaking contact, which spreads wear over more surface. The crusher setting can be maintained over long periods. Changing the lower tier of concaves makes it possible to get various initial settings without changing the angle of nip — a big advantage.

3. Vertical Adjustment to Compensate for Wear

To compensate for wear on mantle and concaves, the *Superior* crusher has been designed so that the mainshaft can be raised with respect to the concaves. This is made possible by a long threaded portion of the mainshaft and a cast steel adjusting nut supported in the spider hub. The curved crushing chamber, moreover, has been designed to utilize this vertical adjustment to the fullest extent in compensating for wear.

The original discharge setting can be maintained, for all practical purposes, throughout the life of a single set of crushing surfaces with no more than one resetting of the concaves.

A-3316

Improved Lubrication System, Dust Seal

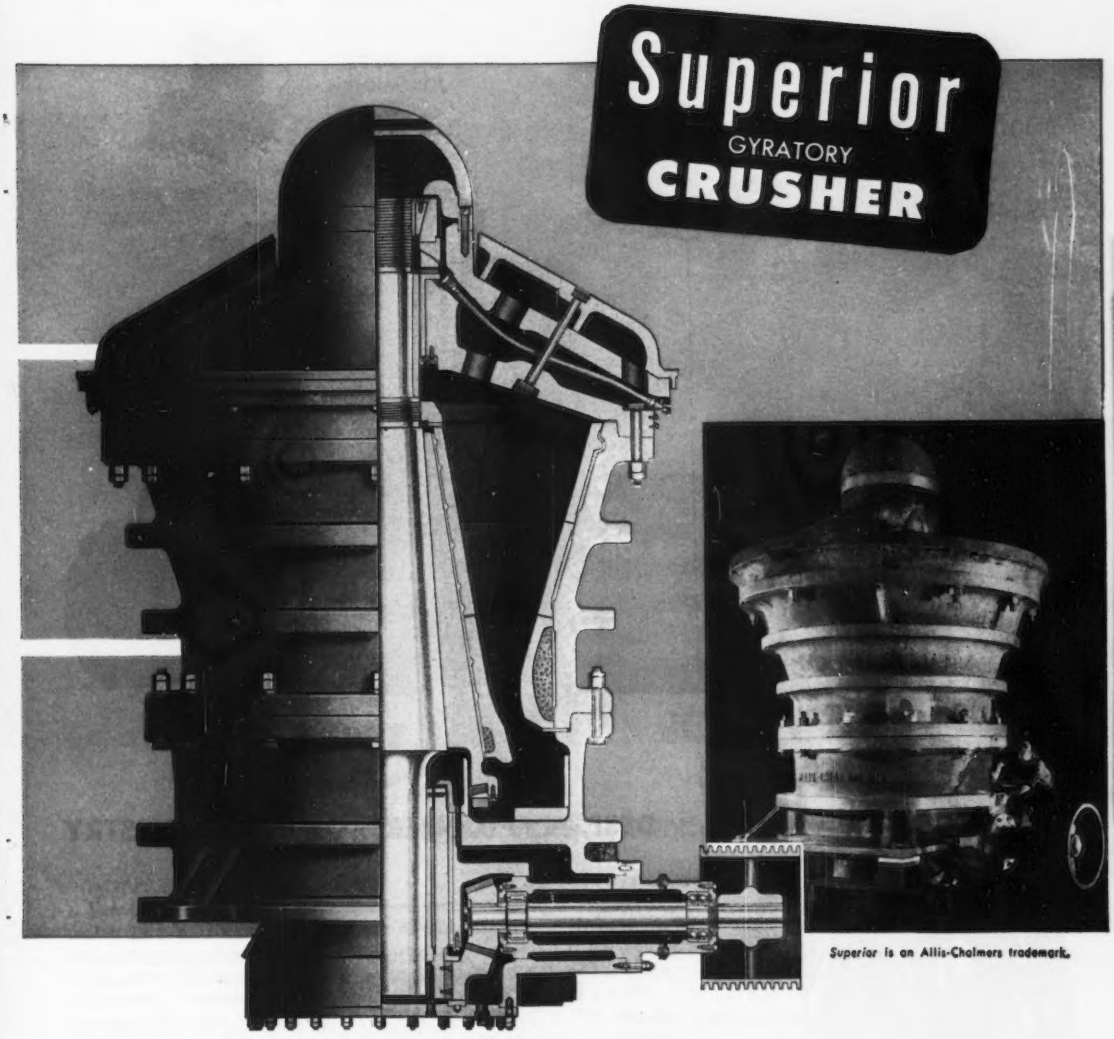
A fully automatic lubricating system consists of a tank, oil pump, motor, pressure type oil filter and condenser type cooler, all external to the crusher for better accessibility. Oil from tank is pumped through filter and cooler to the crusher, lubricating the eccentric wearing plate, then the inner eccentric bearing. It returns down the outer eccentric bearing, lubricates gear and pinion and returns to tank. Oiling system has protective flow and temperature switches.

An improved dust seal consists of a moulded fabric ring enclosed in a steel housing accommodating the vertical adjustment of the crushing cone as well as the gyrating and turning of the head.

More facts about the *Superior* crusher can be obtained from the A-C representative in your area. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-

Primary Crusher
IMPORTANT ADVANTAGES?



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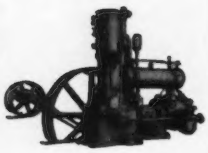
CHALMERS

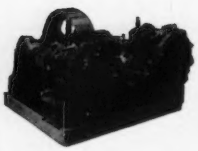
A-C ALLIS-CHALMERS

You're Years Ahead with a

THE LARGE
JOY ANGLE
OF 1930

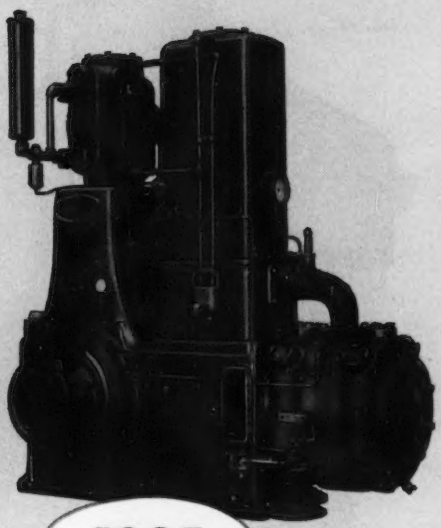
JOY ANGLE COMPOUND
1913
THE FIRST ANGLE
OR L DESIGN





1905
THE JOY CROSS COMPOUND

TYPICAL JOY
ANGLE OR
L DESIGN OF
25 YEARS AGO
(FIRST "PACKAGE" TYPE)



1925

1885
TYPICAL JOY VERTICAL
OF 65 YEARS AGO

DESIGN–PIONEERS OF THE INDUSTRY

These seven Joy compressor illustrations and their dates tell a story of design leadership in the compression of air and gases. Here, we believe, is visual proof of the part Joy has played in the progressive development of compressor design and construction.

We are justly proud of this heritage and what it means. The design of our WN-112 and WN-114 is years ahead of the field, offering greater economies and higher efficiencies to the modern user of air power. We know because we have designed and built them all.

W&J-3242

Consult a Joy Engineer

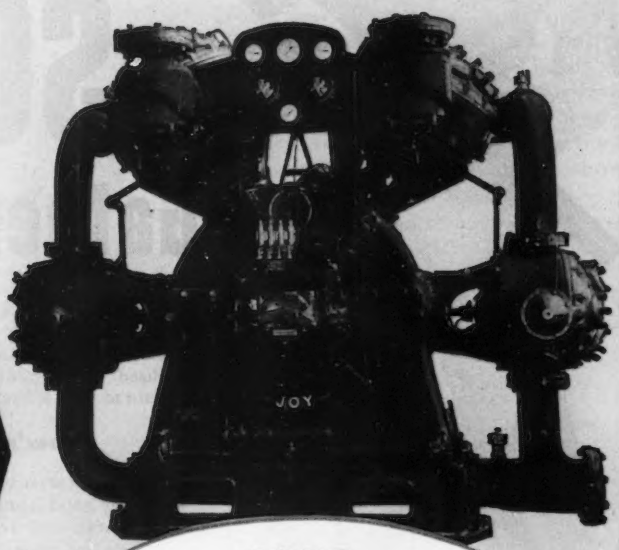
JOY COMPRESSOR

1936
JOY V VERTICAL
THE FIRST OF THE
PRESENT DAY
MODERN TYPE
COMPRESSORS

Compare

the inherent advantages of the old and the new in AIR COMPRESSORS —and insist on these advantages in your COMPRESSED AIR PLANT

● **Let us quote on your requirements**



1950
JOY WN-114

Compare these QUALITY CONSTRUCTION FEATURES

REPLACEABLE CYLINDER LINERS
These satin finished liners assure uniform cylinder walls for efficient heat transfer and eliminate cylinder reboring.

REPLACEABLE CROSSHEAD GUIDES
Honed "mirror-finished" wearing surfaces eliminate periodic crosshead adjustment.

BEARINGS WITH "ROLLING SURFACES"
Anti-friction, spherical roller bearings eliminate wear and need for adjustment inherent in sleeve-type bearings.

HEAVY-DUTY INTERCOOLER
Easily cleaned when necessary—insures maximum cooling for greater compressor efficiency.

LOW HEIGHT
(7 feet 7 inches) eliminates all head-room troubles when servicing or inspecting.

FORCE-FEED LUBRICATION
Use of bronze-screen, replaceable filter unit supplies clean, dirt-free oil to all bearing surfaces.

DIRECT, STREAMLINED AIR PASSAGES
Streamlined air passages with direct connection of intercooler and cylinders give maximum efficiency and minimum piping problems.

DUAL-CUSHION ANGLED VALVES
These valves, in combination with truncated pistons, give minimum valve clearance and maximum compressor efficiency.

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Don't Let IRON and STEEL SCRAP Gather Cobwebs!

Somewhere, back in a corner of your plant or shop, there's some scrap iron and steel. Maybe quite a pile, gathering rust. Maybe some obsolete machinery, long unused. Maybe odds and ends that total many tons. You've meant to have it hauled away, but somehow it's still around.

Now's the time to sell it!

Call the nearest scrap dealer; ask him to give you a price. He'll pay good money for it. Prices are high . . . the nation's steel plants need scrap badly. With a stepped-up defense program under way, scrap is more than ever a vital ingredient of steel production. Industry must help take up the slack—*fast*.

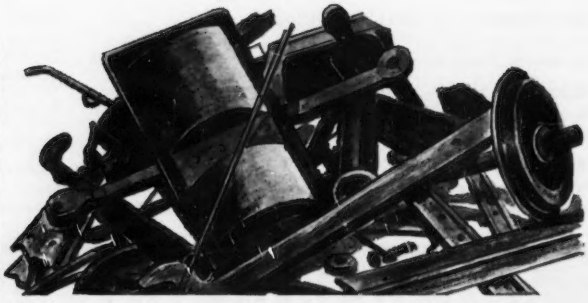
A constant flow of scrap means greater tonnages of iron and steel. It means more finished products made of iron and steel. You can help . . . and help yourself as well. Get that scrap in circulation. Get it on the job!

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BETHLEHEM STEEL

BETHLEHEM STEEL

If you don't know the name of a scrap dealer, look one up in the yellow classified pages of the telephone directory. You'll find a listing there.



Sheffield Steel repeats AGAIN!

A Sixth NORTHWEST for Sheffield Steel Corp.

Houston, Texas

BACK in '48 we told you about the Sheffield Steel Corporation's experiences with Northwest. Performance was so satisfactory and operating cost of Northwest Shovels and Draglines was so low on their operations that they were replacing other machines in their Linden Pits with Northwests. They have recently taken delivery on their sixth Northwest.

Northwest advantages—the Northwest Dual Independent Crowd, Uniform Pressure Swing Clutches, the Cushion Clutch, the "Feather-Touch" Clutch Control, Northwest Simplicity of Design, Ease of Maintenance and other Northwest features combine to make it a *real* Rock Shovel—a mining shovel that means more output at lower cost.

You can plan ahead to have a Northwest. Let us give you full details. Join the Northwest Crowd.

NORTHWEST ENGINEERING COMPANY
1509 Field Bldg, 135 South LaSalle St., Chicago 3, Illinois

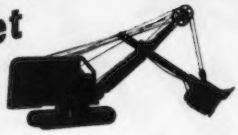
One of Sheffield Steel Corporation's Northwests working in the Jacksonville, Texas, pits.

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

This Excavator Has What It Takes to

Help Operators Get More Work Done



and Boost Your Profits, Too

Bucyrus-Erie excavators give you big advantages that mean peak performance day in and day out. Design balance — developed through years of experience in the field — ties in all the phases of the operating cycle smoothly and efficiently. Highly responsive controls, smooth clutch action and positive, independent crowd help operators get bigger loads every pass . . . more passes every hour.

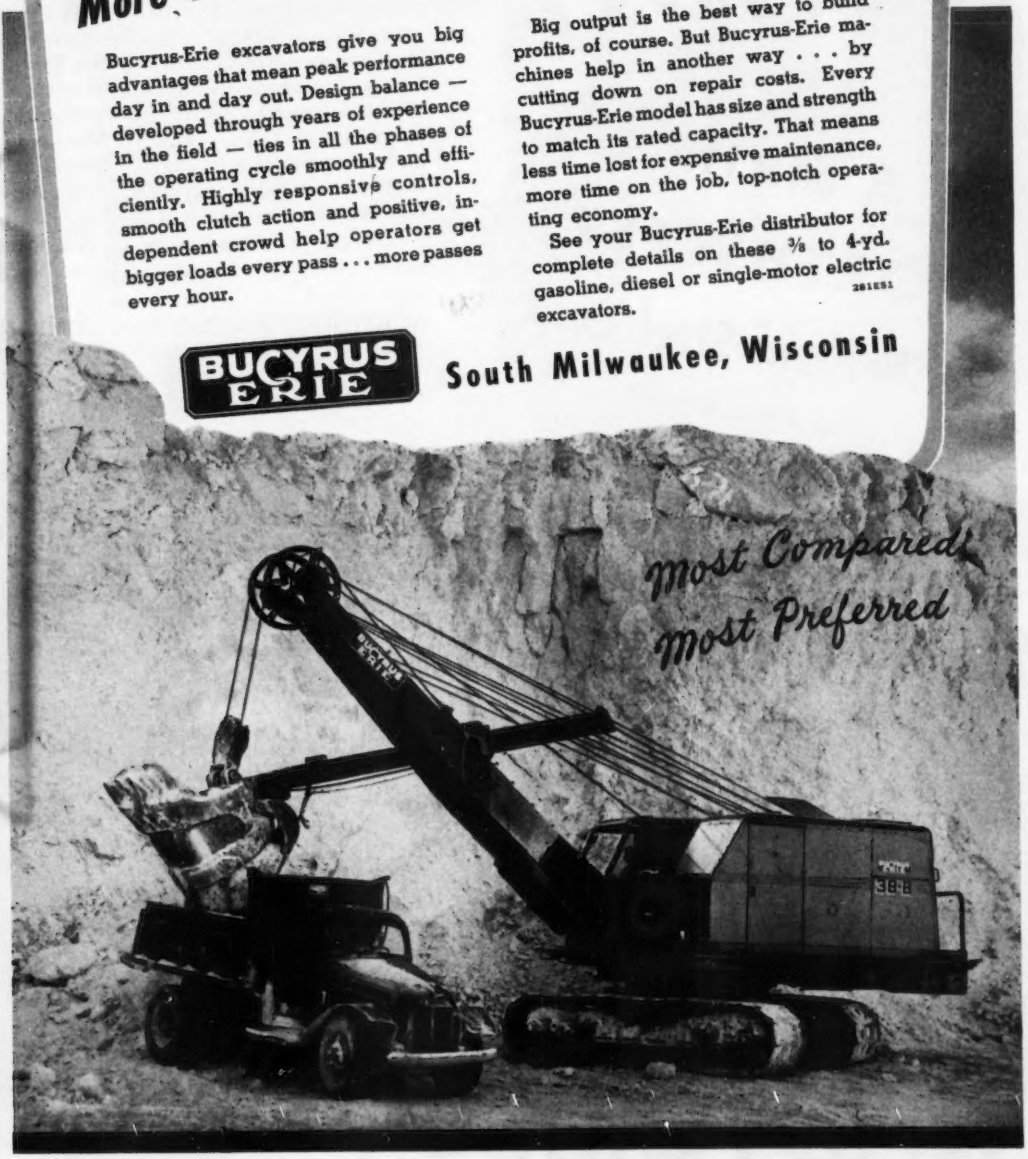
Big output is the best way to build profits, of course. But Bucyrus-Erie machines help in another way . . . by cutting down on repair costs. Every Bucyrus-Erie model has size and strength to match its rated capacity. That means less time lost for expensive maintenance, more time on the job, top-notch operating economy.

See your Bucyrus-Erie distributor for complete details on these ⅜ to 4-yd. gasoline, diesel or single-motor electric excavators.

281ES1

BUCYRUS ERIE

South Milwaukee, Wisconsin



Here's what WE mean by

DESIGNED FOR YOUR JOB

The new Allis-Chalmers tractors are not merely new models incorporating refinements of existing ideas . . . they are new from the ground up . . . without compromise anywhere in design or material.

They are the answer to your demands for tractors that will give you outstanding performance on a variety of applications — whatever those jobs may be.

Behind the design are your own ideas . . . and those of your operators and mechanics . . . combined with the vast experience of Allis-Chalmers.

Check the following outstanding features . . . then get the full story from your Allis-Chalmers dealer on this — "THE FINEST TRACTOR LINE ON EARTH."

POWER TO SPARE — A large untapped reserve (up to 1/3 of peak available hp.) assures easier going on toughest work — longer engine life, less servicing. Moreover, it has been proved that General Motors 2-Cycle Diesels are unmatched in lugging ability; they build up torque faster and higher . . . hold it longer.

MATCHED POWER TRAIN ASSEMBLIES — Each and every part of the power train — from master clutch to final drive — has more than enough capacity and strength to handle any load it was ever meant to carry. Bigger clutches, booster steering, double-reduction final drives, all add life—get more work done.

REVOLUTIONARY SHIFT PATTERN — A quick, one-lever shift from any forward speed to any reverse position saves shifting motion and time — smoother and easier, too.

POSITIVE BALANCE — Tractors work equally well with any equipment — drawn or mounted. There's *greater stability* and *traction* with more track on the ground and lower structural weight. Main and truck frames are heavier, truck frames longer . . . idlers are bigger, and both idlers and sprockets lowered . . . all steel construction throughout. Up to 50 percent more ground clearance!

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

The Newest, Finest Tractor Line on Earth!

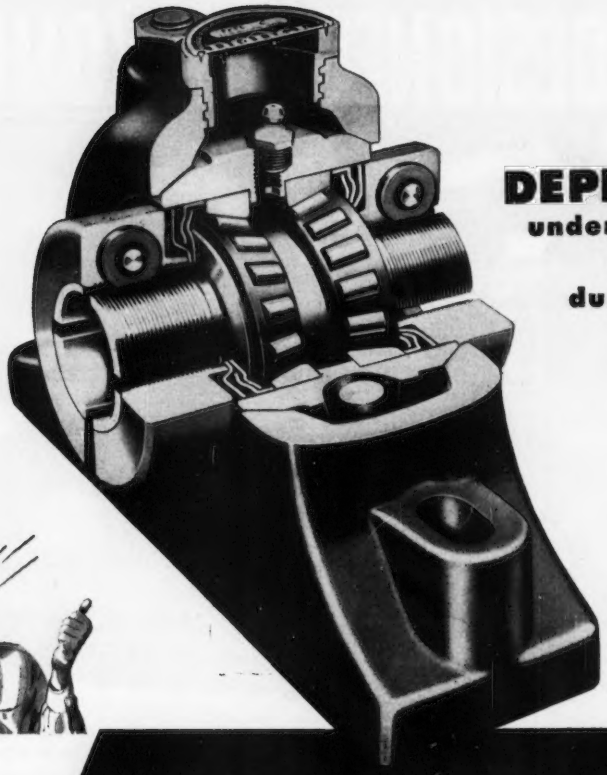
40.26 drawbar hp.
11,250 lb.

70 drawbar hp.
18,800 lb.

102 drawbar hp.
27,850 lb.

Hydraulic Torque Converter Drive
175 net engine hp.
41,000 lb.

- **DESIGNED FOR YOUR JOB**
- **BUILT TO "TAKE IT"**
- **EASY TO OPERATE**
- **EASY TO SERVICE**



DEPENDABLE
under severest conditions of dust and dirt!

DODGE-TIMKEN

- Even under layers of grime, dirt and abrasive dust encountered in many production operations, the Dodge-Timken Type C bearing carries its power load smoothly, efficiently, without interruption—because it's
- Triple-sealed to prevent the entry of dust, however fine. Accurately machined steel seals keep dirt *out* and lubricant *in*.
- Dodge mounts, seals, houses Timken precision bearing units in rugged assemblies (four different types) to deliver a minimum of 30,000 hours uninterrupted service.
- Dodge Timken Type C Pillow Blocks are fully self-aligning, with both radial and thrust carrying capacity.
- Delivered fully assembled, adjusted and lubricated, ready to lock on shaft. Locking collars at both ends insure firm fastening.
- Normally available from Dodge Distributors' stocks, sizes from 1-7/16" to 4-15/16".

DODGE MANUFACTURING CORPORATION, 3100 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor for assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES

TORQUE-ARM SPEED REDUCERS

ROLLING GRIP AND DIAMOND D CLUTCHES

SOLID STEEL CONVEYOR PULLEYS

"They're Dependable!"

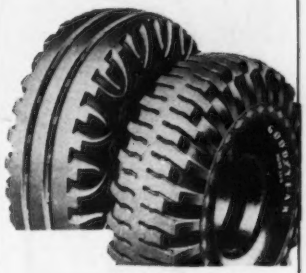
It pays to BUY and SPECIFY Goodyear

Dependability! To cost-conscious mine and quarry operators, that means Goodyear. And for tire-killing rock work, that means Goodyear's HARD ROCK LUG. Like all Goodyear work tires, the HARD ROCK LUG is job-designed for maximum performance on a particular hauling job. Its carcass is extra-tough, is protected against bruising by an extra-thick undertread. Big, tough lug bars armor its tread and sidewalls against cuts and rips. It provides exceptional traction, forward or reverse, with its self-cleaning tread.

The HARD ROCK LUG is your best buy for dependable performance now—and for a long time to come!

THE HARD ROCK RIB

Companion tire for front wheels in rock work—easier steering, smooth rolling, same cord body, same shoulder and sidewall as Hard Rock Lug.



THE ROAD LUG

Remarkable dual-purpose tire operates both OFF and ON the road. Combines off-the-road toughness and traction with on-the-road mileage and economy.

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TIRES THAN ON ANY OTHER KIND

Road Lug—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Know your valve
Do's and don'ts for better piping service
Variations in stem operation of gate, globe, and angle valves
The different types of bonnet joints on gate, globe, and angle valves
PIPING POINTERS
CRANE

Just Out!

NEW 36-PAGE EDITION OF

PIPING POINTERS

...a bigger, more helpful handbook for training maintenance workers

You asked for ¼ million copies of the last edition of Piping Pointers. You found it a big help in training beginners and refreshing veterans in your piping crews. The bigger and better edition is just out —changed in appearance but not in purpose. Crane again offers this booklet—to help keep your piping systems at peak efficiency.

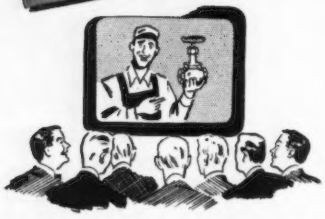
Piping Pointers talks facts . . . not theory. Thoroughly covers the fundamentals of good, sound, everyday piping practices . . . in easy-to-grasp, nontechnical language. Its many "how-to-do-it" features are illustrated for easy understanding.

Mistakes in piping installation and maintenance cost more today. Piping Pointers can help your men avoid them. Just ask your Crane Representative for a copy.

PARTIAL INDEX TO PIPING POINTERS

HOW TO choose valves for every service . . . install valves . . . read reducing fittings . . . make up screwed joints . . . assemble flanged joints . . . make up solder joints . . . install pressure regulators . . . use vent and drain valves . . . avoid steam trap trouble . . . save on pipe joints and materials . . . handle piping tools.

plus THE CRANE VALVE SELECTION GUIDE which saves time and effort in selecting valves for common piping services.



PIPING POINTERS 16-mm SOUND FILM
Free Usage for Group Training

A 30-minute motion picture that dramatizes the fundamental information in the Piping Pointers Manual. Ideal for classroom or plant training groups. Available on request through your local Crane Branch.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

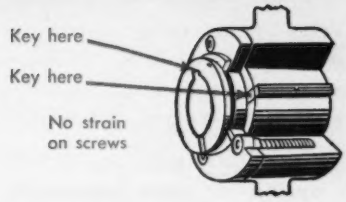
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

ONE PIECE MOUNTING—Bushing and sheave go on together. Alignment is easy. Sheave is on right first time.

TEXROPE
Greatest Name in V-Belt Drives

This... Not This!

FULL CIRCLE GRIP — Bushing split full length. Collar is separate. Shaft gripped full length around full diameter.



POSITIVE DRIVE — Bushing is keyed to both shaft and sheave. No slipping. No sheared screws. No jammed bushings.

USE FAST-MOUNTING Magic-Grip SHEAVES

Full Grip...No Slip!

MAGIC-GRIP SHEAVE is the fastest mounting sheave you can buy. And you can demount it just as fast. It runs true, will not slip or jam. It always comes off easily without hammering, forcing, or distortion.

Best of all it costs no more than an ordinary sheave. Even if you don't change sheaves often, you should have *Magic-Grip* sheaves on every drive to eliminate the possibility of shaft and bearing damage when ordinary sheaves are hammered or pried on or off. Sizes 1 to 250 hp.

WIDEST V-BELT LINE

You can get everything you need for your V-belt drives from one reliable source. Allis-Chalmers offers the broadest line of V-belts, speed changers, and standard and variable speed sheaves in the industry. And you get the extra engineering skill that comes from having more industrial V-belts, installations than any other manufacturer.

Get the 120 page *Texrope* Pre-Engineered Drive Manual 6956 from your A-C Authorized Dealer or Sales Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3240

Sold... Applied... Serviced...

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and *Magic-Grip* are Allis-Chalmers trademarks.

ALLIS-CHALMERS AC

"Great for

says John Hodge of his 4 TOURNAPULLS

Seven miles north of Canton, Georgia, Hodge Mining Company of Cartersville is stripping heavy, ore-bearing clay with a fleet of 4 high-speed, electric-control C Tournapulls. Owner John Hodge reports, "They're great machines . . . fast and rugged." Check performance figures for yourself.

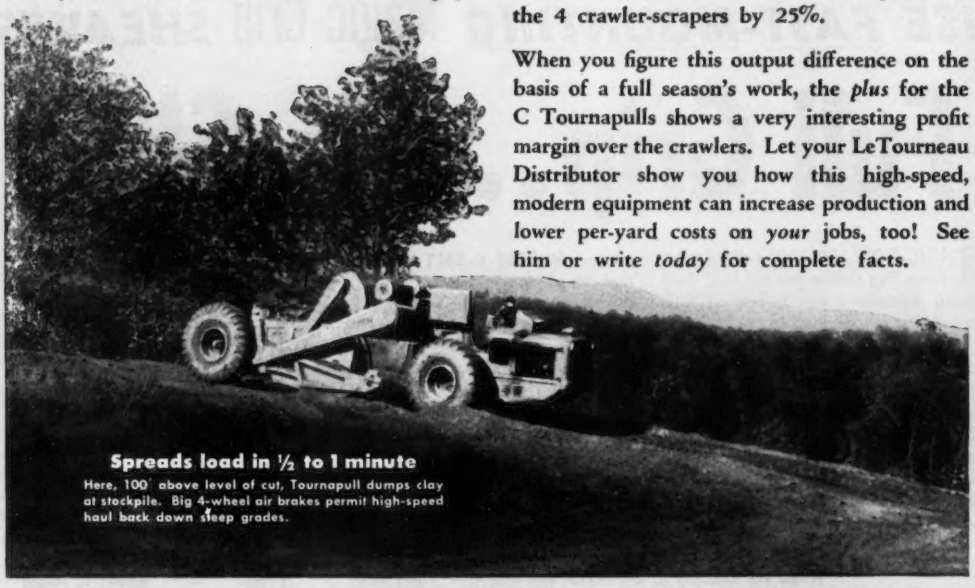
27½ yds. hourly on 15,840′ cycles for each Tournapull

On typical 3-mile cycles between pit and washer, the 4 Tournapulls are averaging 110 pay yards of brown ore hourly. Haul is all uphill . . . with grades that run as high as 15% . . . yet each rubber-tired "C" carries 11 pay yards of the heavy material per trip . . . makes 2 to 3 trips every working hour.

47½ yds. hourly on 2900′ cycles for each Tournapull

On previous mining job, at Taylorsville, Georgia, 3 of Hodge's Tournapulls averaged 15 trips and 142½ pay yards of heavy laminated iron ore per hour on 2900′ cycles . . . while 4 crawler-scraper rigs of 18-yd. capacity, which worked the same haul, delivered only 118 pay yards an hour. In other words, each smaller, faster Tournapull outproduced each slow-moving crawler by 67% . . . 47½ to 28½ yards an hour . . . and the 3 "C's" outproduced the 4 crawler-scrapers by 25%.

When you figure this output difference on the basis of a full season's work, the *plus* for the C Tournapulls shows a very interesting profit margin over the crawlers. Let your LeTourneau Distributor show you how this high-speed, modern equipment can increase production and lower per-yard costs on *your* jobs, too! See him or write *today* for complete facts.



Spreads load in ½ to 1 minute

Here, 100′ above level of cut, Tournapull dumps clay at stockpile. Big 4-wheel air brakes permit high-speed haul back down steep grades.

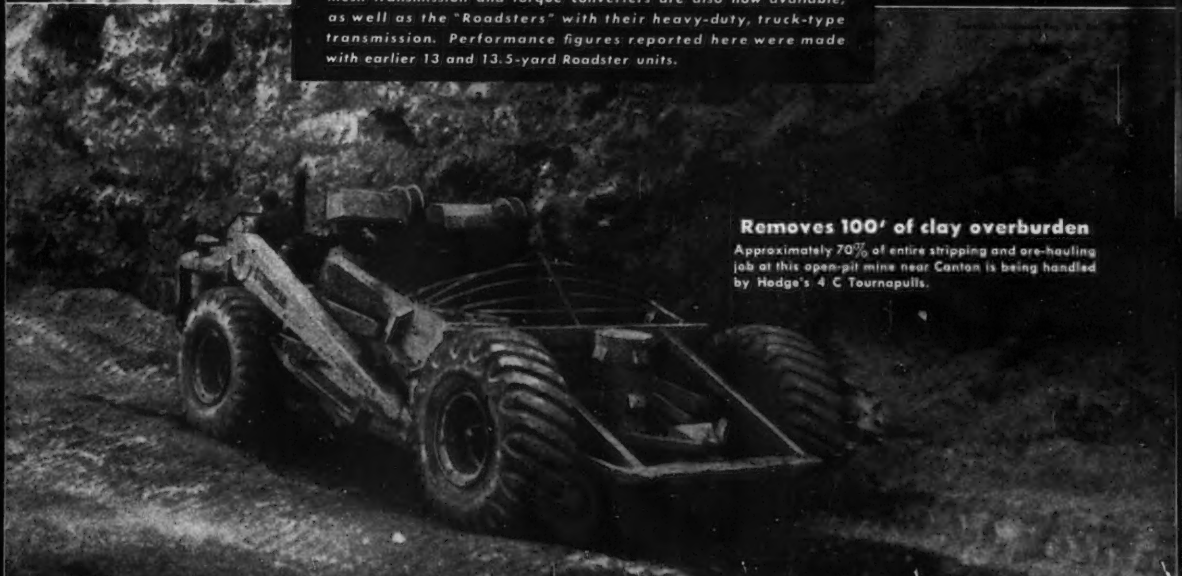
LET HIGH-SPEED, RUBBER-TIRED EXCAVATING • HAULING • LIFTING EQUIPMENT

Stripping."

Hauls 7920′ up 15% grades

Despite sharp turns, 15% adverse grades, and rough roads, Tournapull averages 8.2 m.p.h. for 1½-mi. haul from pit to dump area.

NEW . . . *C Tournapulls now have 18-ton Carryall increasing capacity to 15 yards. Prime movers with Tournamatic constant-mesh transmission and torque converters are also now available, as well as the "Roadsters" with their heavy-duty, truck-type transmission. Performance figures reported here were made with earlier 13 and 13.5-yard Roadster units.*



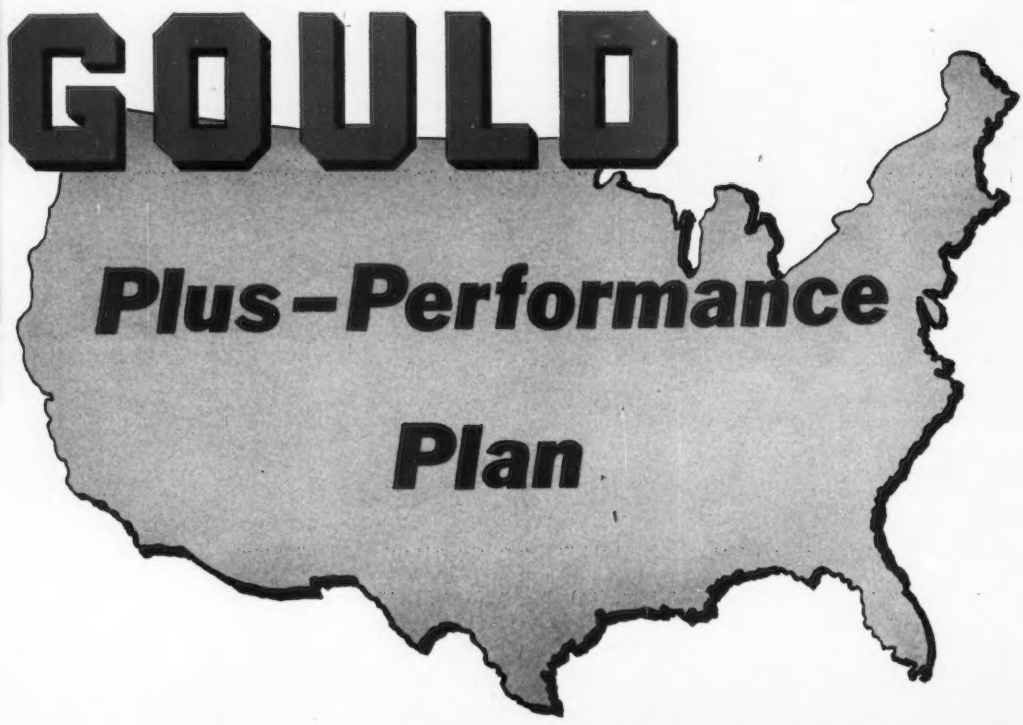
Removes 100′ of clay overburden

Approximately 70% of entire stripping and ore-hauling job at this open-pit mine near Canton is being handled by Hodge's 4 C Tournapulls.

R. G. LeTOURNEAU, INC., PEORIA, ILLINOIS

Here's Help

You demand more and more from your batteries as industry strains its facilities for defense. To help you get more out of these essential tools of production—to choose, use, handle and maintain your batteries without waste— Gould announces the



You Need NOW!

Battery performance can be improved as much as 50%* if these eight points are put into practice:

1. **Buy Your Batteries to Fit the Job.** Purchase of oversized or undersized batteries wastes money, materials and manpower.
2. **Install Your Batteries Correctly.** Connect them properly, ventilate adequately and handle according to printed instructions.
3. **Use Your Batteries Within Designed Capacities.** Overdischarge cuts down battery performance.
4. **Charge Your Batteries Properly.** Use recommended rates of initial, finish and float charges.
5. **Maintain Your Batteries Systematically.** Organize a preventive maintenance program.
6. **Inspect Batteries Periodically.** Tighten loose connections and replace worn cables.
7. **Test Your Batteries Regularly.** Keep a record of cell readings—know the condition of your batteries at all times.
8. **Replace When Necessary.** When you know the condition of your batteries, you can place your orders far enough ahead to insure continuous service.

GOULD'S PLUS-PERFORMANCE PLAN is designed to help you conserve and extend your essential battery power. It is a complete, integrated system of manuals, articles, specifications, bulletins, record cards and charts which give you information on every one of these eight points—explaining and illustrating how to choose, use, install, charge, maintain, inspect and test.

**From tests in the Gould Research Laboratory and performance tests in the field.*

LET THIS PLAN GO TO WORK FOR YOU...WRITE US TODAY!

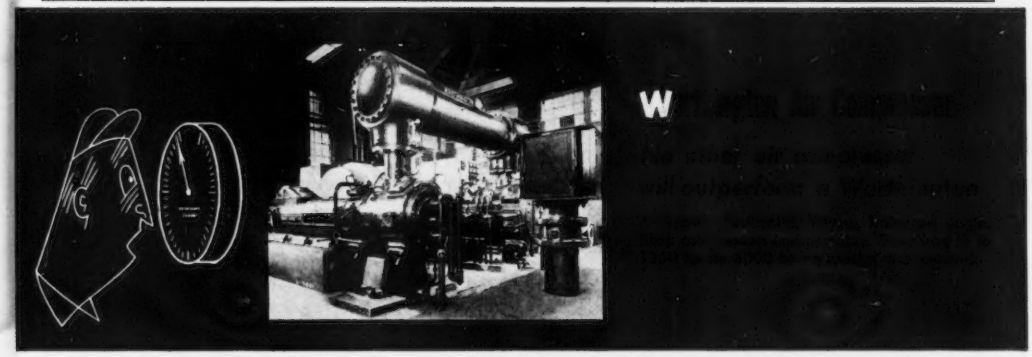
Any or all of the material available under the Gould PLUS-PERFORMANCE PLAN is FREE to battery users without obligation. A request on your letterhead stating the particular problem or problems in which you are interested, will bring the appropriate literature—and booklet explaining the complete plan—by return mail. Write us, attention Field Engineering Department.

GOULD **STORAGE BATTERIES**

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries

W
DRILLING
Worthington BLUE BRUTE Mining Drills and Tools . . .
Built rugged for long life—balanced for easy handling
Hand-held rock drills . . . Available with hand or motor feed mountings. Worthington's efficient jet valve.
Drifters . . . 3, 3½, 4 in. Special "Pneu-Motor" on shell or drifter (also hand crank).
Stopers . . . Operating Handle well above center of gravity for easy handling. Positive, sleeve-type valve—minimum wear.
Clay diggers . . . Built-in ease of handling helps operators get more work done with less fatigue.
Breakers . . . Hard-hitting tools with soft rubber grip handles for dampening vibration.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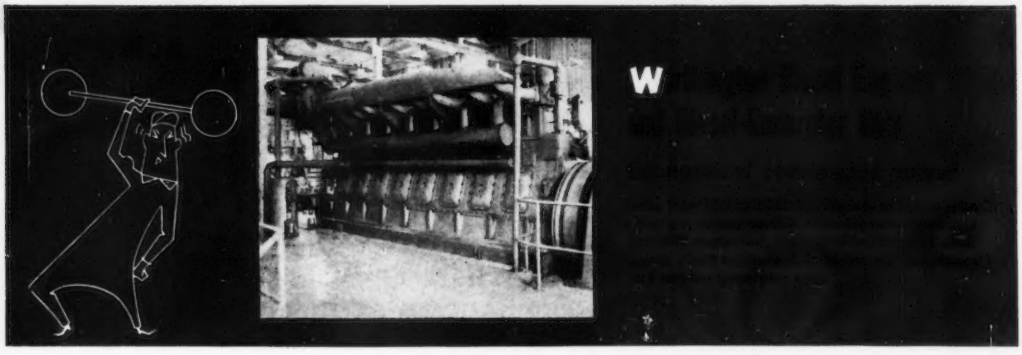
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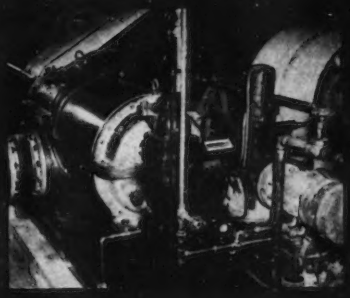

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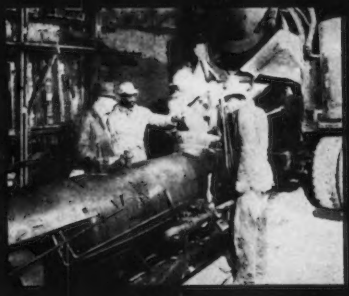
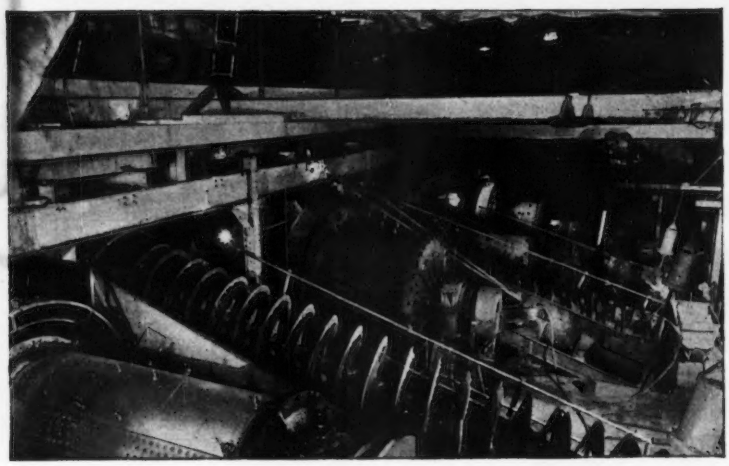


PLUS

WORTHINGTON

Underground lead-zinc mill hits 1200 tons per day!

1 Hauling cars of lead-zinc ore up 15° slope to the underground mill is this 72" drum hoist, driven by G-E 300-hp 440-volt motor and control. Only one of its kind, the Gilman lead and zinc mill was built entirely underground because in the mountainous terrain surrounding it there is not enough level country. Several hundred feet down, in rooms cut out of hard rock, crude ores from the adjacent mine are concentrated for smelting at distant plants.

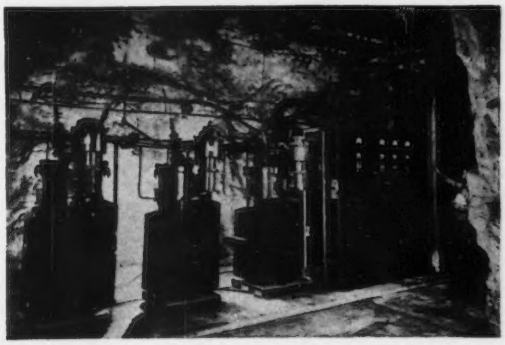


2 In the underground grinding room, two 100-hp and two 75-hp 440-volt G-E motors and control drive grinding mills. Classifier drives consist of four 10-hp G-E motors and control. Naturally heated to 83F, water for grinding process is pumped from mine to mill by G-E induction motors.

GENERAL ELECTRIC

660-23

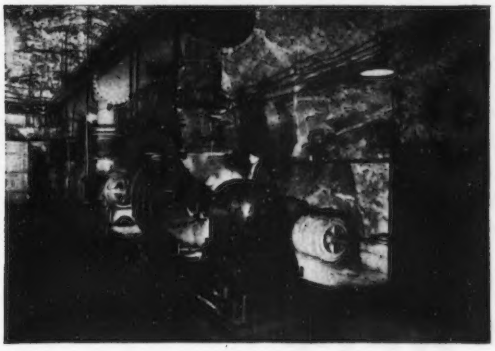
Co-ordinated G-E drives and distribution equipment help maintain continuity of production at New Jersey Zinc's unique Gilman, Colo. concentrating plant



5 **Power for the mine** comes down from the surface at 13,800 volts through 4500 feet of G-E armored cable. At this substation—comprising a G-E switchboard and three 150-kva Pyranol† transformers with gas absorbers—it is stepped down to 440 volts for utilization throughout the mine's two lowest levels.

3 **Grouped motor control** is provided at several points throughout the mill by compact G-E Cabinetrol* units. Space-saving Cabinetrol "packages" include all controls and instruments needed for various milling processes. This neat assembly, together with its associated push-button stations, is located in the mill's flotation cell room.

6 **To protect equipment** against damage from excessive overcurrents caused by heavy overloads or short circuits, the mill uses four G-E 3-pole air circuit breakers rated 600 amperes, 600 volts. G-E air-circuit breakers, selected for adequate interrupting capacity, help safeguard against loss of production in all milling operations.



4 **After grinding the ore,** lead minerals are separated from zinc minerals and waste, and then zinc minerals are separated from waste tailings in flotation cells. Air for flotation cells is supplied by these blowers, driven by three 125-hp 440-volt G-E a-c motors, with G-E control at right.

* Reg. trade mark of General Electric Co. for enclosed control panel equipment.

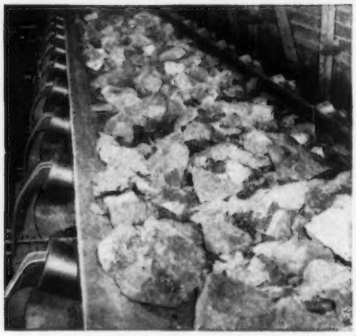
CO-ORDINATED EQUIPMENT

for the Mining Industry

At every stage in ore processing—mining, concentrating, smelting, or refining—a G-E mining industry specialist can help you solve your electrical problems efficiently, economically. He's a good man to know. Call him soon! *General Electric Company, Schenectady 5, N. Y.*

† Registered trade mark of General Electric Co. for askarel.

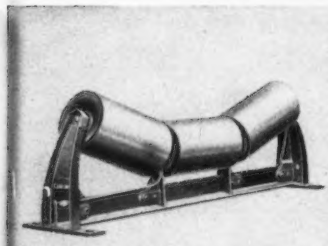
LINK-BELT engineering experience...



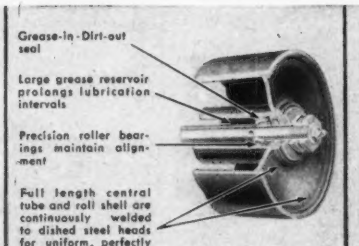
Nickel ore enroute to bin.

Overburden leaving iron ore pit.

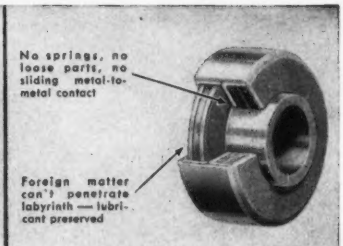
LINK-BELT quality components...



Standard for industry—L-B "100" Idler


Grease-in-Dirt-out seal
Large grease reservoir prolongs lubrication intervals
Precision roller bearings maintain alignment
Full length central tube and roll shell are continuously welded to dished steel heads for uniform, perfectly balanced strength

Less lubrication and adjustment


No springs, no loose parts, no sliding metal-to-metal contact
Foreign matter can't penetrate labyrinth — lubricant preserved

Grease-in-Dirt-out Seal

add up to your best bet in BELT CONVEYORS

In mines all over the world, LINK-BELT Belt Conveyors provide reliable, efficient materials handling

Get the finest in modern materials handling in your mine. It can be as simple as calling in a Link-Belt engineer while you're still in the planning stage.

Thousands agree Link-Belt builds the finest belt conveyors on the market today. More, it has the most complete line of components — all types and sizes — idlers, take-ups, pulleys, trippers, bearings and power transmission drives. Plus all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers, weigh larries.

Equally important, Link-Belt Belt Conveyor engineers can draw on the broadest materials handling background in the industry. They'll work with you and your consultants — help you come up with the right system for your requirements.

Call on your representative, or write us direct for the services of a belt conveyor expert.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12,247-A

Sgt. Robert Chrisman levels a field at the eastern end of the Davison airstrip, Ft. Belvoir, Va., with a "Cat" D7 Tractor. In the background are four "Cat" No. 12 Motor Graders completing runway.

THE MILITARY GETS FIRST CALL

THESE "Caterpillar" earthmoving machines, working on the runway of the Davison airstrip at Ft. Belvoir, Va., show at a glance where a lot of "Cat" equipment is going these days. And that's how it's got to be.

Defense Rated Orders get first call as America's military establishment prepares for what may come. The urgent build-up of our power has meant drafting machines as well as men. An ever-increasing flow of "Caterpillar" equipment and parts is going to the support of America's fighting men and to defense projects.

This means that there already exists a scarcity of "Cat" equipment and engines for civilian use. So it is to *your* advantage to make the machines you now have *last*. You can keep them on the job longer by doing these things:

1 Follow sound and recommended operation and maintenance procedures to the letter. Read and reread your Operator's Instruction Book.

2 Make full use of your "Caterpillar" dealer's facilities for servicing and rebuilding machine parts.

3 Anticipate future parts needs, then contact your dealer and let him help. But *don't* buy or order parts you don't actually need.

Caterpillar Tractor Co. will do everything possible to maintain every "Caterpillar" machine in the field, to provide new machines as fast as possible, and to allocate them as fairly as possible.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

ROCKMASTER "16" TIMINGS

Rockmaster No.	Avg. Time of Each Delay from Zero (milli-seconds)
0 (zero)	0 (inst.)
1	8
2	25
3	50
4	75
5	100
6	125
7	150
8	175
9	200
10	250
11	300
12	350
13	400
14	450
15	500
16	550

Split . . . a . . . second the ROCKMASTER way

and you get Controlled Blasting

THE ROCKMASTER blasting system offers you a choice of *sixteen* split-second delay detonators. Fit the right ones for your job into the complete system—including the correct explosive, drilling pattern and loading procedure—and you've got the key to a smooth flow of blasting power that can mean true

***controlled* force . . . *controlled* throw . . . *controlled* breakage.**

We help you tailor the system to fit your requirements, often with substantial savings in drilling and dynamite, too.

ROCKMASTER may be the answer to your problems whether you blast coal, rock, ore . . . on the surface or underground. Write for your free copy of the ROCKMASTER "16" booklet that includes diagrams of typical loading in quarries, strip pits, mines, and many types of construction.

ROCKMASTER: Reg. U. S. Pat. Off.

ATLAS EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

THIS WAY...

Unlike the housewife who uses bread crumbs and other materials to "stretch" the available supply of hamburger, Simplex is not able to add materials to copper to make it go further. We do achieve the same result, but by an entirely different means. Our way is to insulate the copper with Simplex-Anhydrex XX high voltage insulation. It is the very best "copper extender" that we know.

Simplex-Anhydrex XX is a product of Simplex research and development. It is an insulation that is absolutely "tops" in the high voltage field. It is designed to operate at a maximum of 167° to 176°F. (75° to 80°C.) copper temperature, depending on operating conditions. It has all the properties you want in such a high voltage rubber insulation. It will withstand heat. It also withstands ozone and aging, and it is guaranteed not to absorb more than 15 milligrams of water per square inch of exposed surface when tested in accordance with U. S. Coast Guard standards.

So far as we know it is the only insulation of its kind. Use it wherever you have a high voltage problem, whether the cables are to be installed directly in the earth, underground in ducts, under water, or overhead supported from messenger wire.

You can help to "s-t-r-e-t-c-h" the small available supply of copper by insisting that your high voltage cables be insulated with Simplex-Anhydrex XX insulation. Do you want to know more about this unique insulation? Then fill in the coupon below.

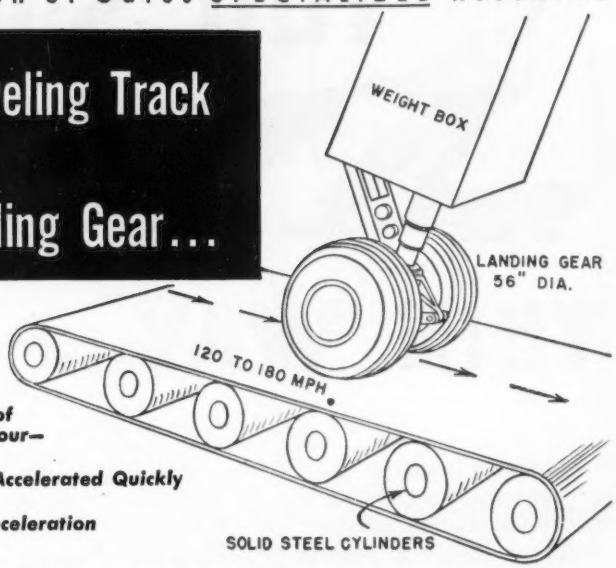
SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:
NAME_____ TITLE_____
COMPANY_____
STREET_____
CITY_____ STATE_____

A Practical Application of Gates SPECIALIZED Research

A High-Speed Traveling Track Used to Test Aircraft Landing Gear...



V-Belt Drive Designed by Gates Engineers

- ***Track Traveling Speed of 120 to 180 miles per hour—***
- ***Massive Weight to be Accelerated Quickly***
- ***Terrific Torque upon Deceleration***

A large Aircraft Manufacturer planned to test aircraft landing gear by dropping the gear onto a track that would travel at airplane landing speeds of 120 to 180 miles per hour. The landing gear would be loaded with weight to equal that of fully loaded aircraft.

Clearly, the shock impact of the loaded gear, its huge wheels motionless, dropping onto the rapidly moving track, would be very great. As the landing gear hits the track, power to the motor is disconnected, permitting the track to travel on its own momentum. To accelerate the huge wheels and slow down the track requires fully 7600 pound feet of torque. Then the drive must bring the massive track mechanism back up to speed in a minimum of time to be ready for the next test.

It was not by accident that Gates Engineers had complete data—*all worked out in advance*—covering the specifications of a V-Belt Drive that has very competently handled this most exacting assignment.

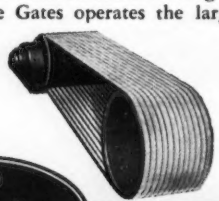
This *pre-solution* of Drive design is possible only because Gates operates the largest V-Belt testing Laboratories in the world. Here, Gates runs an *average* of 32,000 hours of testing *every week* on V-Belts alone! (32,000 hours is equivalent to five years of life for one belt.)

And the real value to *you* of such exhaustive testing is this:—all *results* of these tests are immediately reduced by Gates Application Engineers to *usable data* for the design of V-Belt drives from which *any task whatever* may be required.

Such intensively SPECIALIZED Research has naturally given Gates Engineers a most advanced knowledge of V-Belts and V-Belt Drive Design—and the benefit of this advanced knowledge and experience is available to *you, right in your own plant, any time you want it!*

Whether you have a difficult drive to design—whether some V-Belt drive in your plant is giving trouble—or whether you merely want to know what size and construction of V-Belts will give the most efficient and the lowest cost service on a particular drive—you have only to phone a Gates Engineer near you in all industrial centers.

Just look in your phone book under "Gates Rubber." A Gates Engineer will come to you promptly—and he will put at your service the full benefits of Gates unrivaled V-Belt knowledge and experience *without the slightest obligation!*



ENG-511

Gates VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

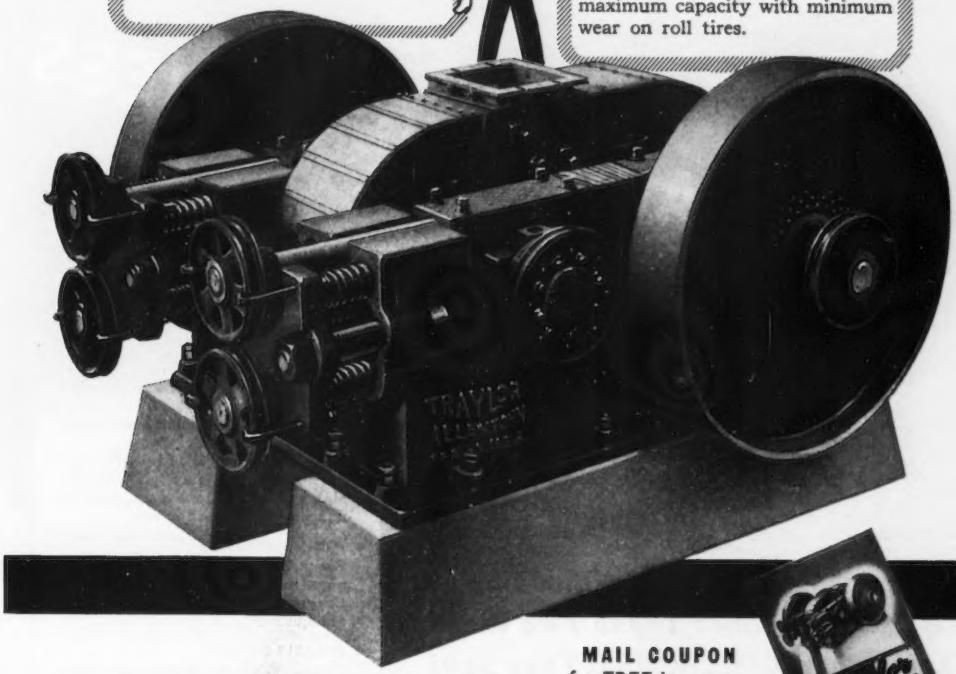
THE GATES RUBBER COMPANY
DENVER, U. S. A.
The World's Largest Makers of V-Belts

Traylor CRUSHING ROLLS

thrive on "choke-feeding"

Traylor Crushing Rolls will produce enormous tonnages with comparatively low power consumption.

Massive, heavy-duty construction permits choke feeding with a continuous stream of material over the entire roll face to insure maximum capacity with minimum wear on roll tires.



Metallic and non-metallic producers will find the answers to their needs for greater production at lower cost in Traylor Crushing Rolls. Traylor Rolls are built in 3 types with a wide range of sizes and capacities. All types are built to withstand rugged, heavy-duty operation with a minimum of maintenance. For complete details send for Traylor's free Roll Bulletin today.

MAIL COUPON
for FREE literature

TRAYLOR ENGINEERING & MANUFACTURING CO.
344 MILL ST., ALLENTOWN, PA.

I am interested in more detailed information on the efficiency of Traylor Crushing Rolls.

Name _____

Company _____

Address _____

SALES OFFICES: New York, N.Y.; Chicago, Ill.; Los Angeles, Calif.
CANADIAN MFRS: Canadian Vickers, Ltd., Montreal, P.Q.

Traylor

Rotary Kilns, Coolers and Dryers • Grinding Mills
Jaw, Reduction and Gyratory Crushers • Crushing Rolls

A "TRAYLOR" LEADS TO GREATER PROFITS

When Choosing V-Belts Remember These Two Words ...They Mean Exactly What They Say!

"DEPENDABLE RUGGEDNESS" didn't get into the BWH trade mark by accident. It means *precisely* what it says . . . Bull Dog V-Belts assure steady, smooth, low cost power transmission — *uninterrupted by premature belt failure.* You save on maintenance costs, keep the wheels of power moving!

TOUGH PROBLEMS INVITED — Ask us or your nearest BWH distributor about your power transmission belting, conveyor belting and hose problems. We're specialists in making mechanical rubber products work *better, longer.*

- **SPECIALLY ENGINEERED BWH CORD SECTION**
  Noted for high tensile strength. *Benefit:* superior load carrying capacity, ability to absorb shock loads, uniform matching when used in sets.
- **MINIMUM STRETCH**
  Results from a new, exclusive technique in processing Bull Dog Cords. *Benefit:* reduced slippage, a minimum of adjustments, longer belt life.
- **DURABLE COVERS**
  The secret's in the closeness of weave of the heavy, bias cut fabric. *Benefit:* it can take the severe wearing action of the sheave while sealing the belt against moisture, dirt and grease.
- **WITHSTANDS SEVEREST FLEXING**
  The "reason why" here is due to constant research in the development of quality - controlled compounds by BWH. *Benefit:* these compounds run cooler and do not crack or deteriorate under severe flexing.

For these reasons make your next V-Belt purchase order read "Bull Dogs" — and buy them by the set!

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

It's Safety First All The Way with MANCHA'S ELECTRIC MULES

the TITAN

featuring Trackmaster* design, is rugged, tough, and safe. Built in two sizes: AN, 4 tons; BN, 2½ tons.

*REG. U. S. PAT. OFFICE

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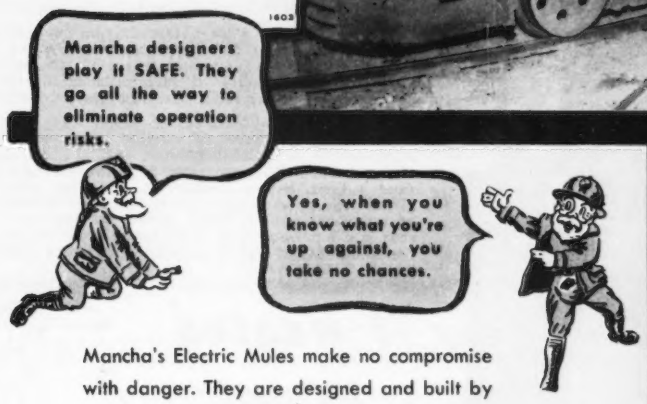
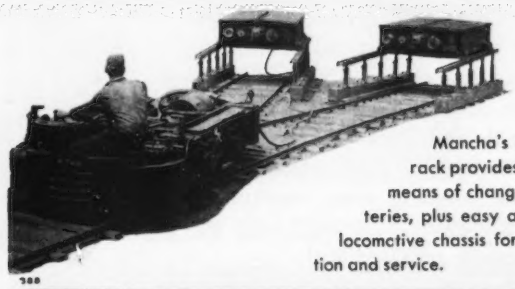

Mancha designers play it SAFE. They go all the way to eliminate operation risks.
Yes, when you know what you're up against, you take no chances.

Mancha's Electric Mules make no compromise with danger. They are designed and built by men who know mining, who anticipate mining hazards, and who act to offset trouble before it develops. That's why Mancha locomotives are safe all the way—particularly for the men who operate them.

These distinctive characteristics make Mancha's Electric Mules completely safe and reliable:

- Spring suspension, wheel equalizers, ample track clearance and low height promote safe operation on unusually bad track, where curves are sharp and clearance limited.
- The motorman is assured protection. Cast steel end cabs, rolled steel side plates, rounded bumpers, and extra large cab space combine to make his job comfortable as well as safe.
- Oversize motor; unbreakable alloy grids; anti-friction bearings; substantial battery box which excludes dirt and water; accessibility throughout.



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Mancha's transfer rack provides a quick means of changing batteries, plus easy access to locomotive chassis for inspection and service.

Mail the coupon for illustrated bulletin showing performance charts and complete specifications.

Mancha Storage Battery Locomotive, U.S.A.
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MANCHA STORAGE BATTERY LOCOMOTIVE

Division GOODMAN Manufacturing Company
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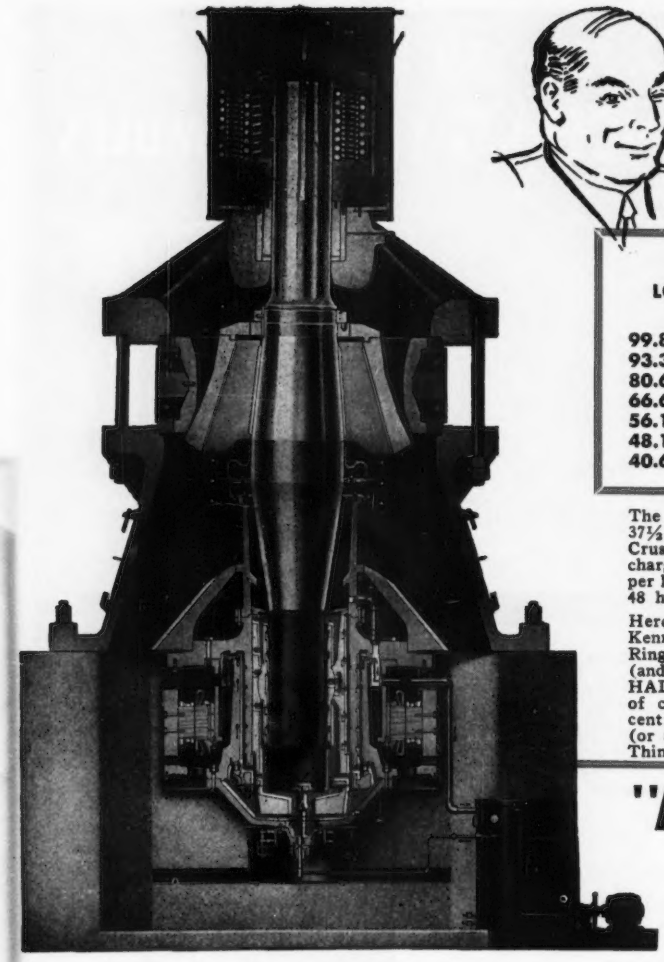


"I wanted PROOF and I got it!"

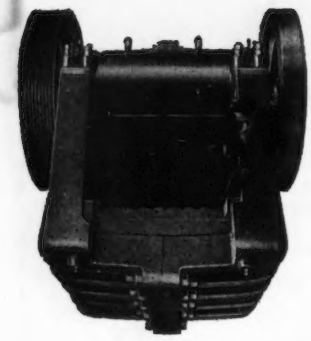
LOOK AT THESE GRADATION FIGURES ON CLOSED CIRCUIT OPERATION

99.8%	Minus	3	MESH
93.3	"	4	"
80.6	"	6	"
66.6	"	8	"
56.1	"	10	"
48.1	"	14	"
40.6	"	20	"

The above results were obtained from four No. 37½ Kennedy type "S" Roller Bearing Gyratory Crushers. The feed opening was 6¼", the discharge 7/32". Capacity of each crusher 56 tons per hour; the power requirements of each crusher 48 h.p.

Here are the results of another test run! A Kennedy No. 37½ Crusher with a Special Grinding Ring 3" Feed Opening gave 50% more product (and a finer, better product at that) for about HALF the power cost of a competitive crusher of comparable size. With power costing say 1 cent per h.p. hour, this KVS saved some 40 h.p. (or about $11.00 daily) or around $3,000 a year. Think THAT over!

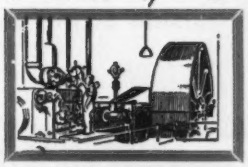
"I wanted LONG LIFE— and here's the answer!"



Yes Sir—if it's DOUBLE crushing life you want, remember that not only is the crushing plate in the Swing Jaw of this KVS RENEWABLE, but both Swing and Stationary jaws are interchangeable and reversible end for end. Another feature is the way the Stationary jaw takes 50% of the crushing load, resulting in a great saving in power. You can't beat any "KVS" for economy and results!

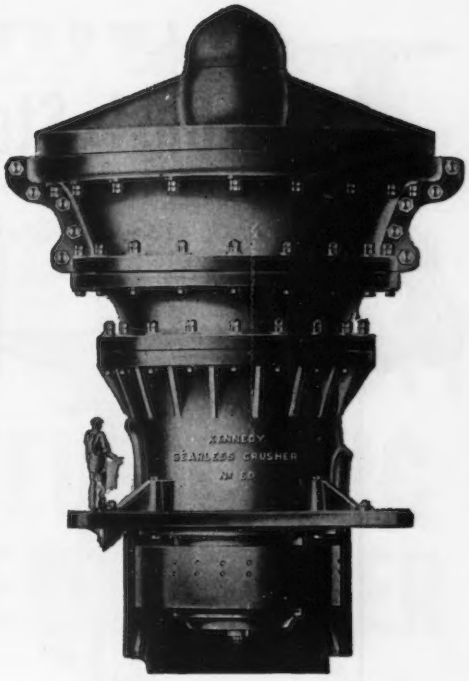
WANT PRODUCTION WITHOUT TROUBLE?

"I wanted POWER and I got it!"



Remember how the big whirling flywheel or pulley of an old Corliss Engine developed KINETIC ENERGY? That means added FREE power! The BIG Pulley in the "KVS" Gearless gives you the same result. It revolves at 3,500 ft. per minute—creates EXTRA crushing power you get free for nothing! The 11 ton pulley (used in a "KVS" Gearless Crusher weighing 400,000 lbs.) turns so easily you can turn it with TWO FINGERS! Man, when you want more CRUSHING with LESS POWER, less vibration and less NOISE, the "KVS" Gearless is the answer to your requirements.

"KVS" GEARLESS GIVES YOU ADDED FREE POWER!



"I wanted to SAVE $5,000 and I did it!"

Planning to install a tube or ball mill? SAVE $5,000—maybe more by using a "KVS" 10 ft. diameter Mill with integral gear drive with SYNCHRONOUS MOTOR DIRECT CONNECTED to driving shaft carried in roller bearings that CANNOT be misaligned or set wrong. Pinion shaft runs at about 600 r.p.m. Pinion shafts in other mills run at about 180 r.p.m. "KVS" trunnions on large sized tube and ball mills CARRIED ON OIL. Bearing never wears out, uses little power. All gears and bearings automatically oil sprayed before mill is started (design pat'd). In 15 years on this type mill no "KVS" gears or pinions have worn out.

WANT The latest KVS Bulletins? Write for them today!

YOU WANT "KVS"!

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MANUFACTURING AND ENGINEERING CORPORATION
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FACTORIES:
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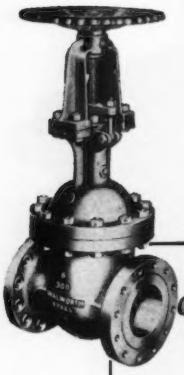
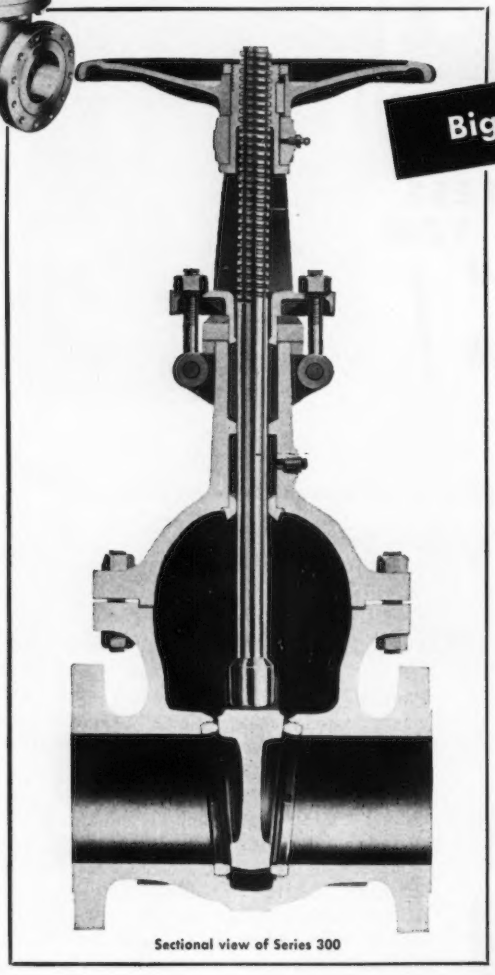
WALWORTH

Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke





Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2" to 24") insure tightness and maximum packing life – costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion – they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated – not flange type. No recess exists at back of ring – hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

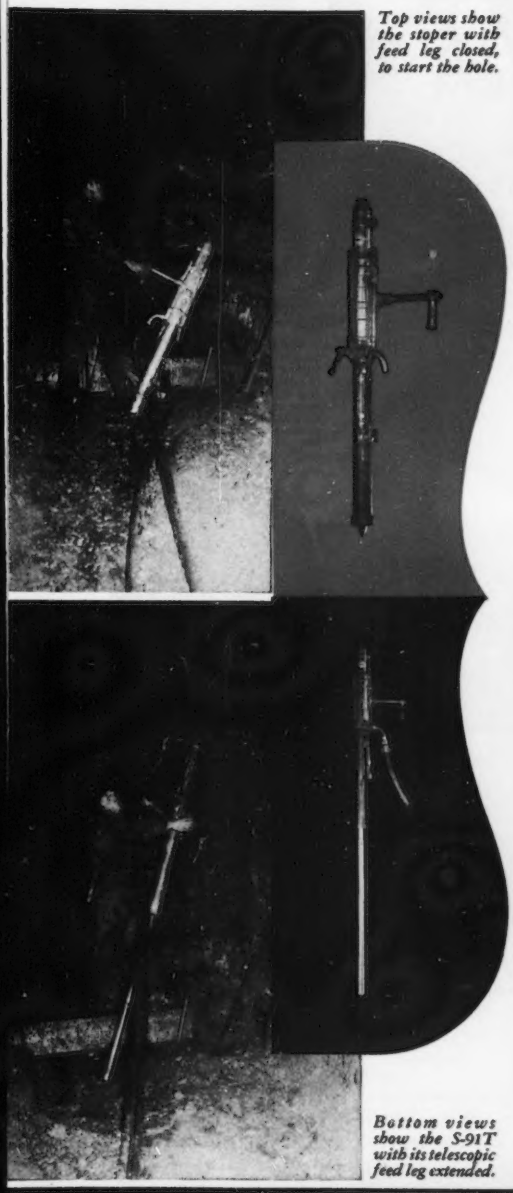
WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Figure what YOU can save with the new



Top views show the stoper with feed leg closed, to start the hole.

Bottom views show the S-91T with its telescopic feed leg extended.

JOY S-91T TELESCOPIC FEED STOPER

Check these Advantages!

FEWER STEEL CHANGES

Now—36" steel changes with the Joy S-91T! In most cases, this eliminates at least one length of steel—cuts your investment in drill steel by 30 to 50%—lets you get full benefit from carbide or other long-wearing bits.

MORE TIME FOR DRILLING

With less time out for changing steel, there's more time for making footage. That means more feet of hole per drilling shift, at lower cost per foot. Less work for your drill operators, too—they'll like and prefer the S-91T.

SHORT LENGTH—LOW WEIGHT

The telescopic feed leg makes possible 36" steel changes while decreasing the overall length of the drill, and without appreciably increasing its weight. Only 52" long, the S-91T is ideal for narrow stopes, starting cross cuts, etc.

EXCLUSIVE DRILLING FEATURES

With "thumb-flip" rotation control for safe, easy spotting of holes—with the famous Joy "Dual Valve" that makes air do more work—the S-91T definitely represents the latest improvement in stoper design. ● Let us *prove* it!

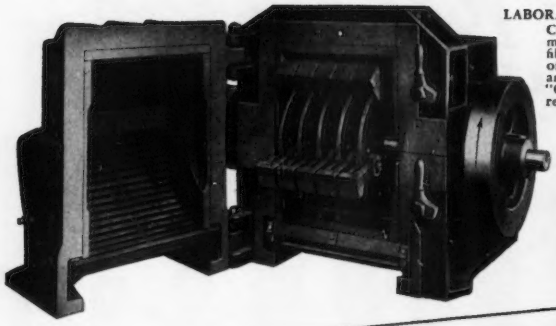
Consult a Joy Engineer

WAD M3284

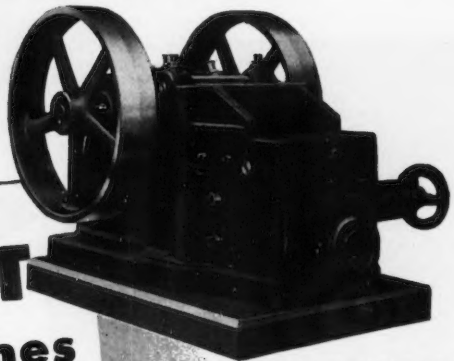
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

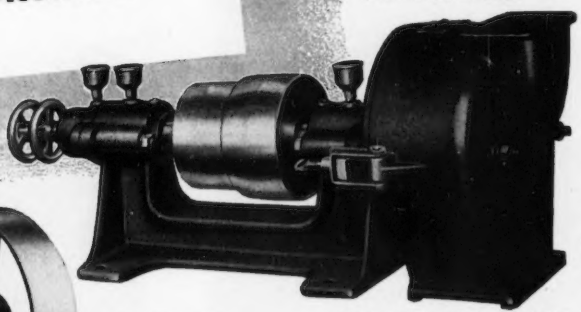


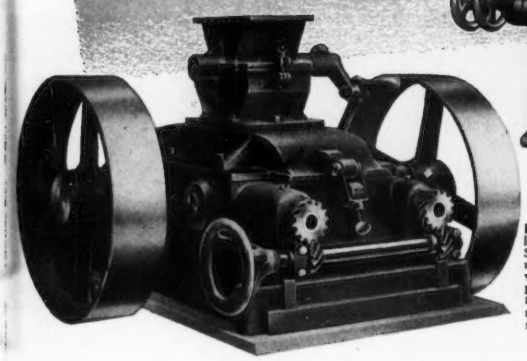
LABORATORY SWING-SLEDGE MILLS
Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



STURTEVANT
Laboratory Machines
Assure Quality of Products
Fast - Economical - Accurate

LABORATORY JAW CRUSHERS
Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS
First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

LABORATORY SAMPLE GRINDER
Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

Investigate Sturtevant equipment for your laboratory. It will cut your sampling costs . . . help maintain strict quality of products . . . increase sales. Write for complete details and catalog.

STURTEVANT MILL COMPANY
101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS •

50 LB. 1¼ X 8
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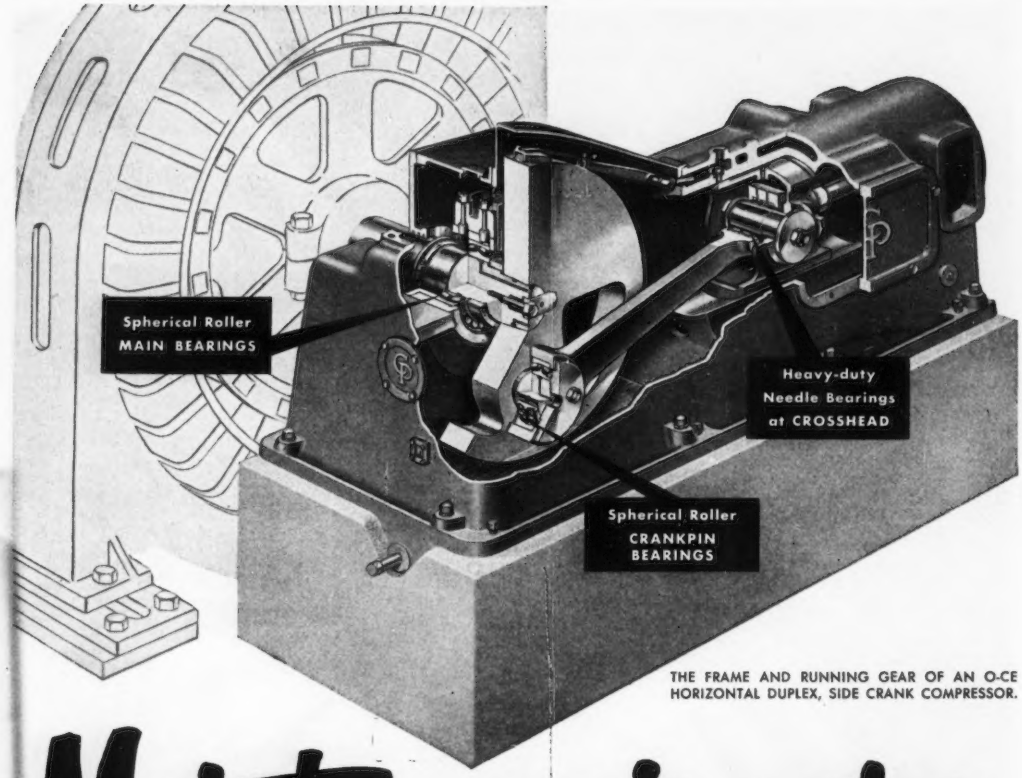
50 LB. 1¼ X 8
HERCULES
HERCOMITE
4
GET MORE E.P. PER DOLLAR



THE FRAME AND RUNNING GEAR OF AN O-CE HORIZONTAL DUPLEX, SIDE CRANK COMPRESSOR.

Maintenance is easier

on Class O-CE Air Compressors, because they now have anti-friction roller bearings throughout. Anti-friction bearings have compressor life expectancy. The spherical roller main and crankpin bearings and the heavy-duty needle bearings at the crosshead pins are self-aligning.

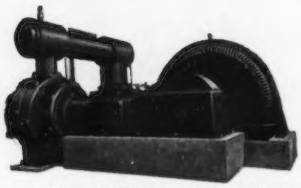
The use of these anti-friction bearings throughout the compressor eliminates all danger of bearing failure, due to maladjustment, and consequent seizure of other parts.

Spherical roller crankpin bearings also permit the use of a solid end connecting rod—the strongest, safest type.

Flood lubrication of bearings and running gear—with no pump or pump drive to fail—no small oil lines to clog—provides a continuous oil supply that constantly floods all main and connecting rod bearings and crossheads.

Class O-CE Motor-driven Compressors are furnished in sizes up to 2000 h.p.

Write for Bulletin 726-5



CLASS O-CE HORIZONTAL DUPLEX COMPRESSOR

A Complete Line

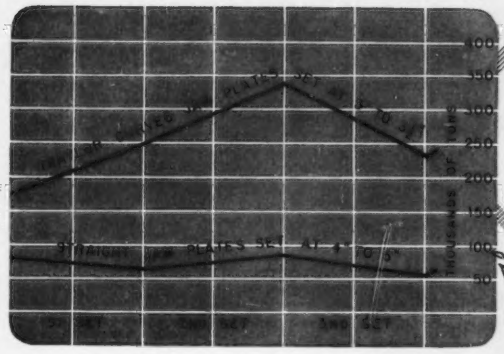
CP Compressors range from 7½ to 2000 h.p., in electric and steam-driven types, pressures to 5000 lbs.; vertical and horizontal models; CP Vacuum Pumps from 7½ to 1000 h.p.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Traylor Curved Jaw Crusher Plates outlast ordinary plates almost 3 to 1



This chart is based on actual records kept on a 36″ x 48″ jaw crusher. Operating at a setting of 4″ to 5″, the average life of straight jaw plates was 96,500 tons. When fitted with Traylor smooth-faced, *curved* jaw plates, this same crusher averaged 276,724 tons per set . . . *at a setting of 3″ to 3½″*. Plate life was increased almost 3 to 1!

No choking . . . no packing . . . stops power waste. Crushing force is used with greater efficiency to produce a more uniform product with fewer waste fines.

Traylor Curved Jaw Crusher Plates . . . standard equipment on all Traylor Jaw Crushers . . . can be installed in many other crushers to transform them into modern, up-to-date primary breakers. Traylor's Curved Crushing Surfaces cut costs of primary stone reduction in *many* ways . . . outlast ordinary plates as much as 3 *to* 1. If you want to increase the efficiency of your plant, investigate Traylor Curved Jaw Plates today.

MAIL COUPON *to get full details.*

TRAYLOR ENGINEERING & MANUFACTURING CO.
344 MILL ST., ALLENTOWN, PA.

I want to see how easily Traylor Curved Jaw Plates can be installed in my present crusher.

*Name*_____

*Company*_____

*Address*_____

SALES OFFICES: New York, N.Y.; Chicago, Ill., Los Angeles, Calif.
Canadian Mfrs: Canadian Vickers, Ltd, Montreal, P.Q.

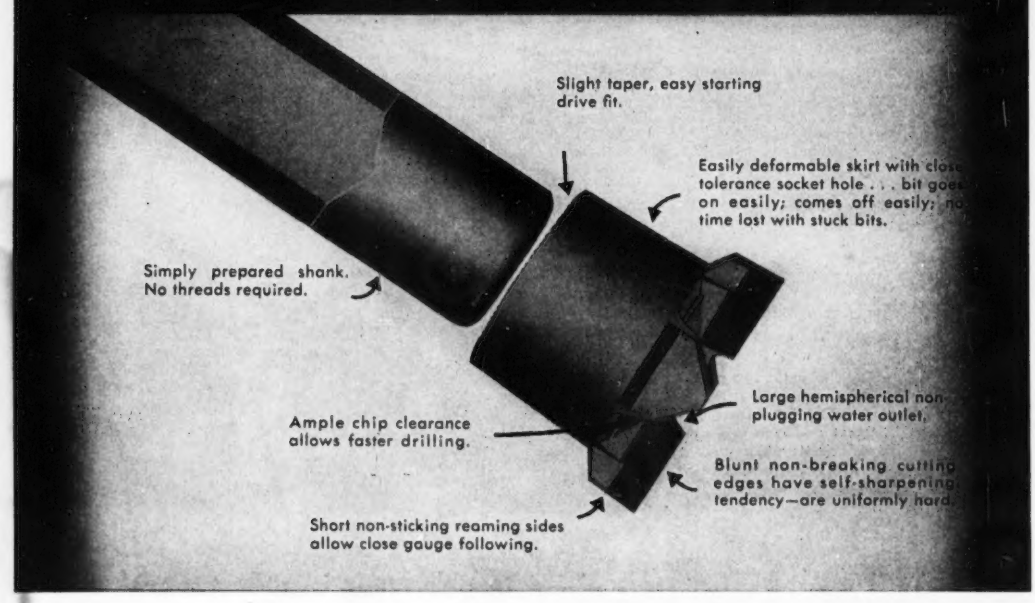
Traylor

Rotary Kilns, Coolers and Dryers • Grinding Mills
Jaw, Reduction and Gyratory Crushers • Crushing Rolls

A "TRAYLOR" LEADS TO GREATER PROFITS

THROWAWAY

DETACHABLE ROCK BITS


Slight taper, easy starting drive fit.
Easily deformable skirt with close tolerance socket hole . . . bit goes on easily; comes off easily; no time lost with stuck bits.
Simply prepared shank. No threads required.
Large hemispherical non-plugging water outlet.
Ample chip clearance allows faster drilling.
Blunt non-breaking cutting edges have self-sharpening tendency—are uniformly hard.
Short non-sticking reaming sides allow close gauge following.

The Throwaway 1¼" Socket Steel Bit

Suitable for Wagon Drills

These Throwaway steel bits will take a beating, and will cut rock fast. They have a large chip clearance and will give many feet of economical drilling.

Made in all sizes from 2½" to 2" with ⅛" gauge changes.

The Throwaway Standard 1" Socket Steel Bit

Suitable for Wagon Drills, Drifters, Jackhammers, and Stopers

This is the old favorite which has been used for economical drilling all over the world. Used on any type or size of steel, machined, ground or forged to fit its 1" socket.

Sizes from 2 1/4" to 1 9/16" with 1/16" gauge changes.

The Throwaway 7/8" Socket Steel Bit

Suitable for Jackhammers and Stopers

These bits were primarily designed for roof suspension bolt holes and general use, with ⅞" hexagon or quarter-octagon steel.

Sizes 1⅝" to 1¼" with 1/16" gauge changes.

Fully descriptive literature on all products is available. Competent field engineers and dealers are always at your service.

Some territories still open for distributors and jobbers.

THROWAWAY BIT CORPORATION

4200 N.W. Yeon Ave. Portland, Oregon, U. S. A.

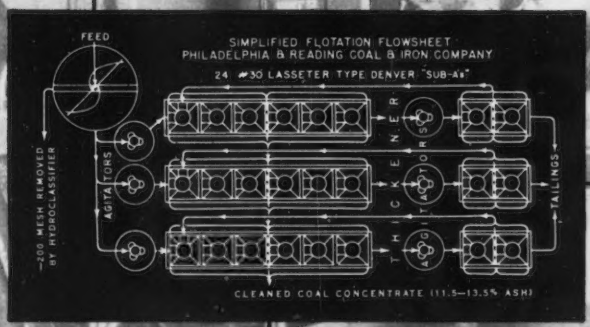
CUT COAL CLEANING COSTS

with Denver "Sub-A" (Lasseter Type) Flotation

Philadelphia and Reading Coal and Iron Company — Now operating at the rate of one ton of marketable coal fines per minute.

FEED

Ash: 24-30%



REJECT

Ash: 59-65%

CLEAN COAL

Ash: 11.5-13.5%

Products: Anthracite Coal Fines
Particle Size: Minus 10 mesh to plus 200 mesh
Tonnage: 120 TPH initial feed
Flotation Cells: 24 No. 30 (Lasseter type) Denver "Sub-A" Cells
Flotation Concentrate: Sixty tons per hour (One ton per minute)
Ash Content: 11.5-13.5%
Reagent Cost: Less than 15 cents per ton feed

Write for Bulletin M4-B57

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

FLOTATION ENGINEERS

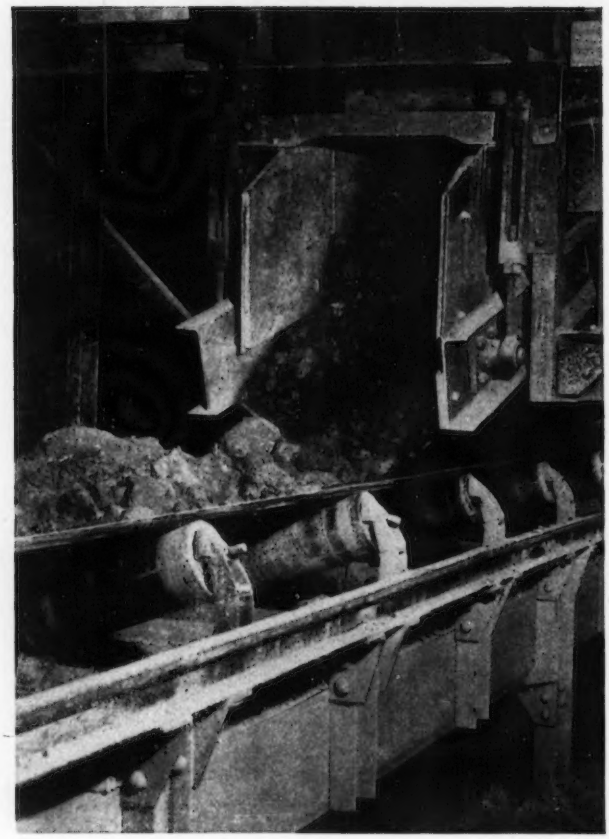
BE SURE TO SEE
DENVER COAL FLOTATION IN ACTION
at the Cleveland Coal Convention & Exposition, May 14-17.
Write for descriptive literature on the Philadelphia & Reading operation and the complete Denver Flotation process as seen at the Cleveland Coal Convention and Exposition.

"The firm that makes its friends happier, healthier and wealthier"
DENVER • NEW YORK • CHICAGO • EL PASO • VANCOUVER • TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG

DENVER EQUIPMENT COMPANY, 1402 17th St., Denver 17, Colorado

ONE POUND OF DIAMONDS

from 15,000,000 lbs. of earth



Leon Levson Photo

Low cost per ton of earth handled was specified to S-A engineers as a must in big-scale diamond mining. To recover enough diamonds to make operations profitable, it is necessary to move tremendous quantities of blue ground;—the ratio by weight is about one part in fifteen million.

S-A engineers drew on their complete line of equipment and 50 years' experience for a combination of efficient units to attain maximum output of diamond-bearing earth—recovery of one pound of diamonds involves moving approximately 15,000,000 lbs. of earth. Experience has proved conclusively that S-A Belt Conveyors have the capacity and stamina to handle such huge quantities of earth—at lowest cost per ton.

Diamonds or otherwise, if you have a bulk materials handling problem, it will pay you to review the details with an S-A engineer—no fee or obligation. Write today.

PREMIER DIAMOND MINE
Cullinan, Transvaal,
Union of South Africa

Illustration shows blue ground being drawn from 2000-ton stockpile and fed onto one of two main belt S-A Conveyors. This moves material to crushing plant. Other S-A Belt Conveyors throughout the plant handle material in the various stages of processing. Nearly 100% push button supervision is achieved in handling a huge tonnage of raw material in this continuous process. Complete mechanization of this recovery plant assures top flexibility, compactness and economy in manpower and labor costs.

1901-1951

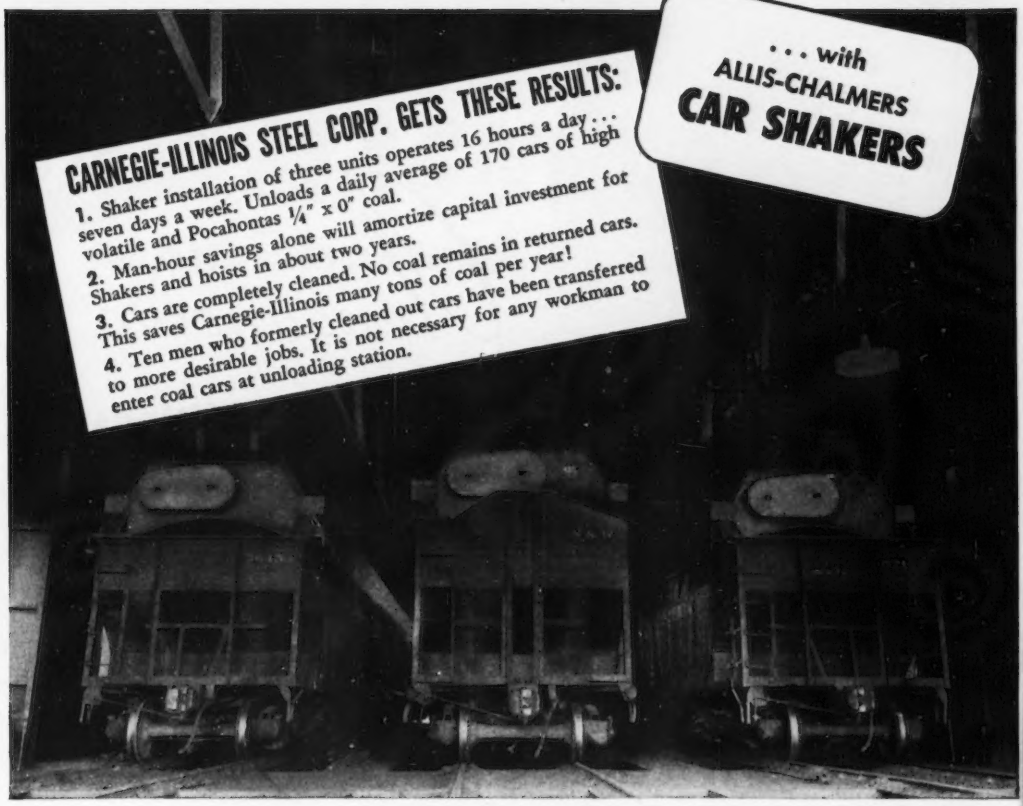
50 years experience with bulk handling

STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif. • Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

STEEL MILL UNLOADS 170 Coal Cars Daily!


CARNEGIE-ILLINOIS STEEL CORP. GETS THESE RESULTS:
1. Shaker installation of three units operates 16 hours a day . . . seven days a week. Unloads a daily average of 170 cars of high volatile and Pocahontas ¼" x 0" coal.
2. Man-hour savings alone will amortize capital investment for Shakers and hoists in about two years.
3. Cars are completely cleaned. No coal remains in returned cars. This saves Carnegie-Illinois many tons of coal per year!
4. Ten men who formerly cleaned out cars have been transferred to more desirable jobs. It is not necessary for any workman to enter coal cars at unloading station.
. . . with
ALLIS-CHALMERS
CAR SHAKERS

YOU CAN GET SIMILAR SAVINGS in demurrage charges and man-hours by installing an Allis-Chalmers Car Shaker. And you save with safety! Accidents are eliminated as workmen do not have to mount the car during the automatic unloading operation.

The Shaker is driven by a 15 hp, high torque, integrally enclosed Allis-Chalmers motor — mounted on rubber to protect motor from severe vibration.

For complete information on how the Car Shaker can help *you* save time and money, contact your nearby A-C Sales Office. Or write for Bulletin 07B7221.

ALLIS-CHALMERS, 969A SO. 70 ST.
MILWAUKEE, WIS.

Please send Car Shaker Bulletin 07B7221.

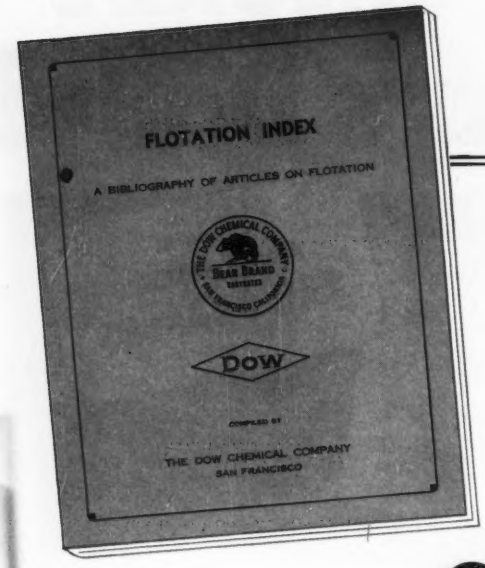
Name .....

Title .....

Firm .....

Address A-3171

ALLIS-CHALMERS



Announcing

21st annual additions to the Flotation Index

To maintain the most complete authoritative guide to published material on the flotation process . . . request our twenty-first annual supplement for your BEAR BRAND FLOTATION INDEX. Many of the listings and descriptions of books and articles in the 1951 compilation are of particular note.

BEAR BRAND XANTHATES

THE DOW CHEMICAL COMPANY — DOW — San Francisco 4, California, U.S.A.

Pioneer Producers of Xanthates for Metallurgical Use

The Dow Chemical Company
Dept. A, 310 Sansome St., San Francisco 4, Calif.

Please send me _____ copies of the 21st Annual supplement to bring my BEAR BRAND FLOTATION INDEX up to date.

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Position _____

Ask for your copy Simply fill in the coupon and mail

ROCK RATED!

MEANS RUGGED STRENGTH

P&H MAGNETORQUE*

MEANS SMOOTHER, FASTER SWING

IF YOUR work calls for heavy going — in mine and quarry — here's the machine *designed* for it — the P&H 1055 (3½ yds.).

Here's tough, all-welded construction to take abuse in stride . . . extra stability so you can use all the power you need . . . speed and smooth operation in every function to give you maximum output.

MAGNETORQUE ELECTRIC SWING gives you faster swing, more accurate control with less strain on machine and operator. No more swing frictions with their adjustments and replacement costs.

See this real ROCK RATED shovel in action and judge for yourself.

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

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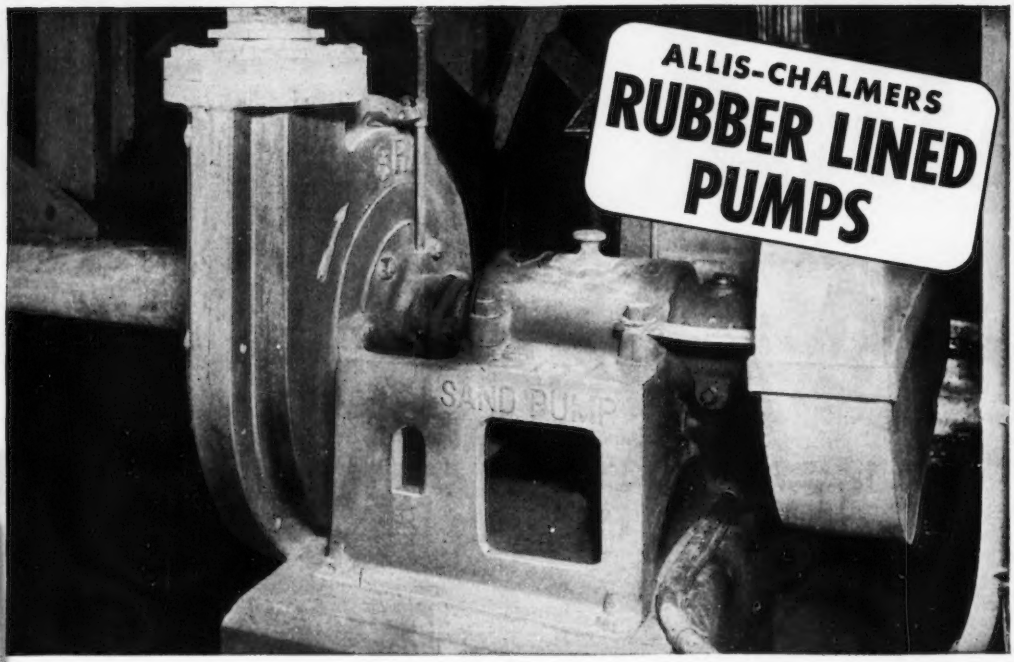
CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES



Gives You 4 Big Economies In Handling Fine Mesh Materials

1. **Long Life** — Rubber compounds especially made for each application provide from 10 to 50 times the wear resistance of the hardest metals on such jobs as pumping tailings, classifier overflow, grinding mill discharge and other operations involving hard, abrasive materials of ⅛" to 325 mesh size.
2. **Easy Servicing** — The rubber casing liner is completely separate from the casing. It may be removed and replaced without moving the pump itself. The impeller is screwed onto the shaft and also may be removed easily. Thus, a complete supply of spare parts may be kept on hand at moderate cost. Neither standby pumps nor long shutdowns for pump rehabilitation are required.
3. **Flexibility In Operation** — The Allis-Chalmers Rubber Lined Pump is usually driven by a *Texrope* V-belt drive. Its head and capacity may be varied considerably by simply changing the speed of the drive. Where changes are frequent, the *Vari-Pitch* Automatic sheave provides instant speed control at very moderate cost.
4. **Application Engineering** — Each job is individually engineered by a competent Allis-Chalmers application engineer who is familiar with solids pumping problems. You can be sure of exactly the right pump and exactly the right materials for lowest cost per ton pumped.

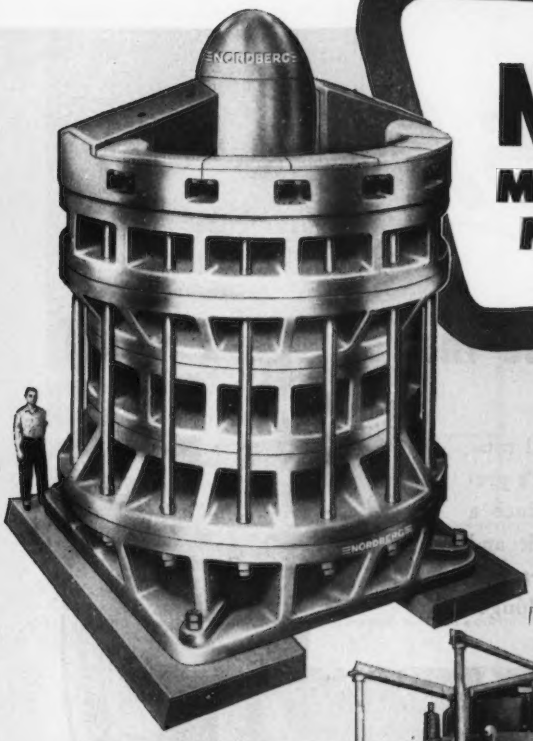
Get full details on what the Allis-Chalmers Rubber Lined Pump can do for you. Call your A-C District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin, and ask for Bulletin 08B7311. A-3347

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

NORDBERG

MACHINERY FOR THE MINING INDUSTRY



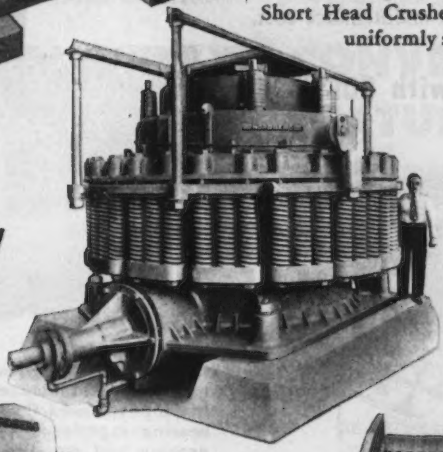
HERE is dependable NORDBERG MACHINERY designed and built especially for the Mining Industry—to assure maximum and continuous production at low operating and maintenance costs. For primary and reduction crushing and all stages of screening, NORDBERG MACHINERY has been proven in service by mining operators throughout the world.

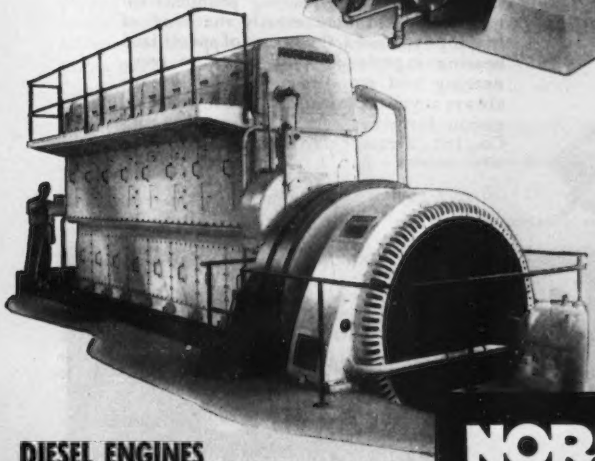
NORDBERG MACHINERY includes Gyratory Crushers for primary breaking; Symons Standard and Short Head Crushers for preparation of finely and uniformly sized mill feed; Vibrating Grizzlies and Screens for scalping and sizing; wet and dry grinding Ball, Tube, and Rod Mills.

For dependable low-cost power, a complete line of NORDBERG Diesel Engines is available in sizes ranging from 10 h.p. to 9600 h.p.—a range of sizes to provide the solution to practically any power problem the Mining Industry may have.

Write for literature on the machinery you need.

GYRATORY and CONE CRUSHERS for Primary, Secondary and Fine Reduction Crushing





VIBRATING GRIZZLIES and SCREENS for Scalping and Sizing

M251

DIESEL ENGINES

2 and 4-cycle, 10 to 9600 hp. Burn Gas, Oil or any Combination of Both.

NORDBERG MFG. CO.

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NORDBERG MACHINERY

SMOOTHER RUNNING?

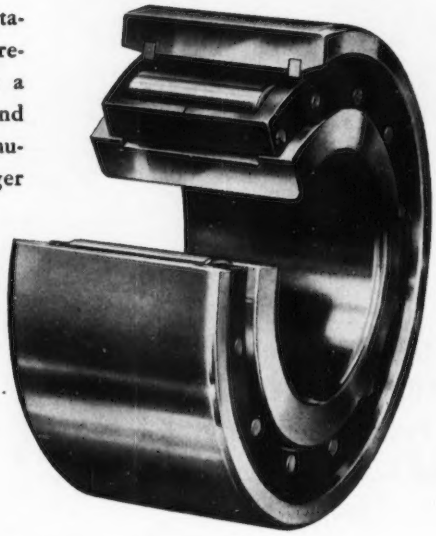
LOWER MAINTENANCE?

LONGER BEARING LIFE?

Yes!

. . . because they're MADE RIGHT

Rollway's *right-angle* design promotes true orbital rotation of the rollers around the shaft. And Rollway's precision machining and rigorous inspection produce a bearing with a minimum of end-rub, side-shock and sliding friction of the rollers. Designed right—manufactured right—your Rollway bearings assure you longer wear, less down-time and lower maintenance cost.

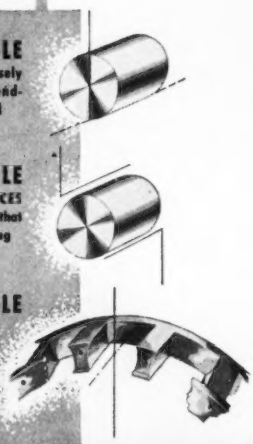


ROLL the RIGHT Way with ROLLWAY

RIGHT-ANGLE ROLLER ENDS, precisely square to avoid end-rub, oscillation and side-shock.

RIGHT-ANGLE BEARING SURFACES with parallelism that results in unwavering rightline rolling.

RIGHT-ANGLE SEPARATOR SLOTS accurately machined to prevent roller skew, slide and uneven wear.



Let's examine your bearing problems together to determine exactly the kind of bearings you need. Our years of specialized bearing experience, plus complete engineering and metallurgical services, are always at your command. No cost. No obligation. Just write or wire Rollway Bearing Co., Inc., Syracuse, N. Y.

SALES OFFICES

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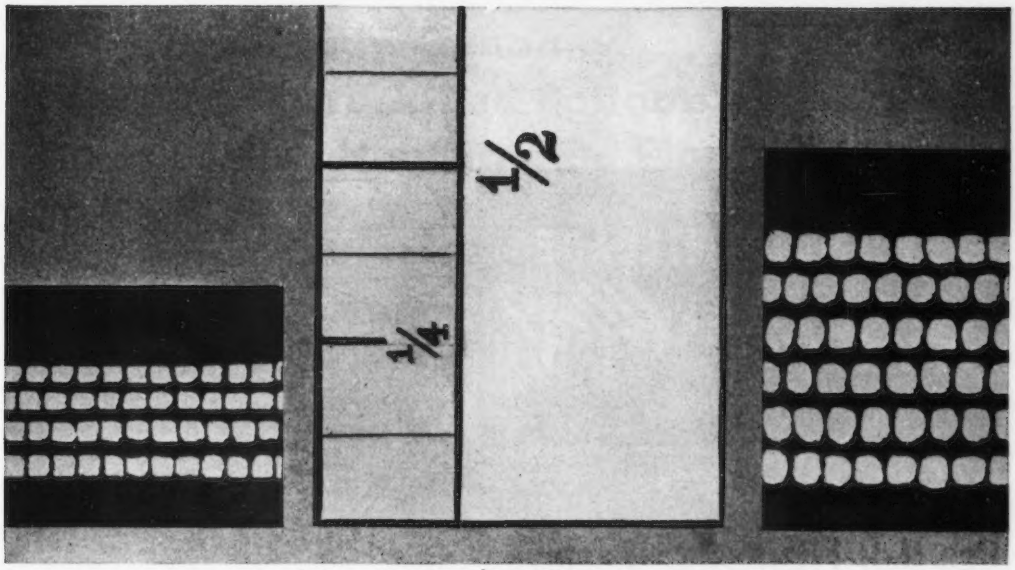
ROLLWAY BEARINGS

Complete Line of Radial and Thrust Cylindrical Roller Bearings



GREATER STRENGTH of belts built with "Cordura" is illustrated above (enlarged in scale to show detail of construction). At left is cross-section of four-ply belt sinewed with "Cordura." It's stronger than conventional six-ply belt at right, yet only half as thick. This thin, light belt is particularly desirable where panel equipment is moved frequently.

WILL YOUR NEXT CONVEYOR BELT HAVE THESE FEATURES?

Here are four operating advantages you can have built in your next conveyor belt simply by asking your supplier to build it on Du Pont Cordura* High Tenacity Rayon. This is the industrial yarn that gives strength to heavy-duty truck tires and lightweight high-pressure hose. And it makes a stronger and easier-to-operate belt . . . at no extra cost.

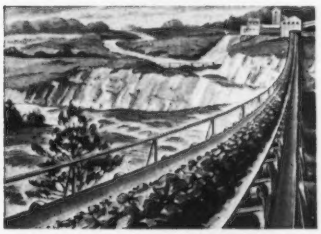
We will be glad to send you the names of suppliers of these efficient belts. You can also get full information about "Cordura" in the new manual "Sinews for Industry." It gives physical properties of "Cordura" rayon, describes many successful applications and tells how "Cordura" improves the efficiency of conveyor systems. For your free copy, address Room **4529,** Rayon Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware. *Reg. U. S. Pat. Off.

DU PONT "CORDURA" HIGH TENACITY RAYON

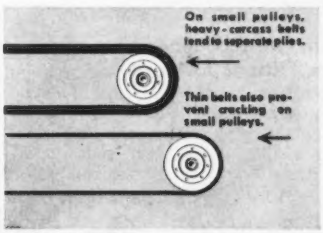
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

for RAYON . . . for NYLON . . . for fibers to come look to DU PONT



SPAN LONGER LIFTS. The high tensile strength of "Cordura" rayon eliminates costly transfer points. For example, a belt reinforced with seven plies of "Cordura" can lift 1000 tons of overburden per hour up a 15° slope over 1000-foot centers. It has design tension of 900 pounds per inch of width.



MORE FLEXIBILITY. Belts built with "Cordura" have less tendency to crack and separate plies when run over small pulleys required in confined working space. And belts built with "Cordura" have less stretch, so less take-up room is needed. And they trough well under any loading conditions.

HEAVIER LOADING CAPACITY is possible on conveyor belts built with Du Pont "Cordura" High Tenacity Rayon. This yarn is inherently stronger than the natural fibers commonly used. It packs extra strength into conveyor belts and enables them to carry loads to the capacity of power equipment.

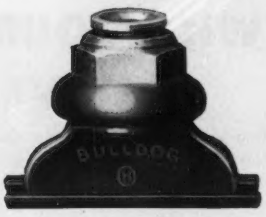
GET MORE MILEAGE *From Your Wire!*

Use O-B Fittings to Remove Cause of Wear

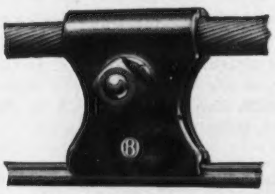
Because of their bump-free method of wire-holding, O-B High Mileage Trolley Wire Fittings reduce wire wear and increase the number of current collector passes on your overhead system. Mileage, the total distance traveled by current collectors on your wire, is an important figure. Higher mileage means lower costs for you in terms of wire and wire maintenance.

O-B High Mileage Trolley Wire Fittings remove the principal cause of wire wear—arcing—by removing the bumps and bouncing which cause arcing between the collector and the wire. Clamps and splicers do this by holding the wire at its upper lobe only. Frogs and crossovers, in addition, provide a smooth transition from wire to runner and from runner to wire. Because it presents such a smooth underrun, current collectors cling to a wire which is held with O-B fittings.

High speed haulage without bumping and burning—high mileage from the trolley wire—low maintenance—these are the reasons why we recommend O-B "High Mileage" Trolley Wire Fittings for your next overhead installation or renovation.



O-B Bulldog Trolley Clamp



O-B Combination Feeder-Trolley Clamp

O-B Bulldog Trolley Wire Splicer

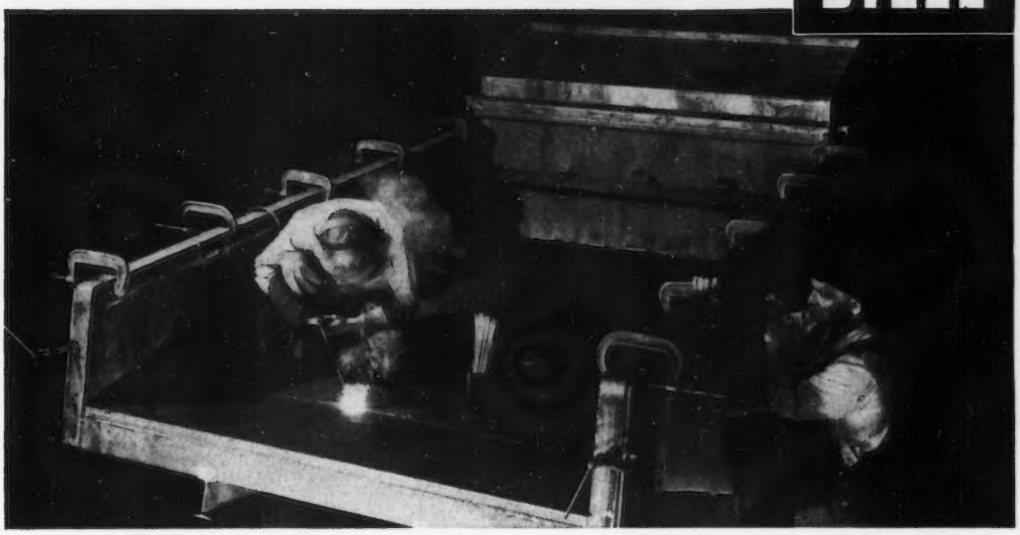
Ohio Brass

MANSFIELD OHIO, U.S.A.

4104-M CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

Moore Body Company "ARMORS" Truck-Bed Bottoms with J & L Jalloy Heat-Treated Plate

J&L STEEL



Workman welding 3/16" Jalloy heat-treated plate in this Moore truck body. In construction no significant welding problems have been encountered.

Impact- and Abrasion-Resistant Jalloy Plates Increase Service Life . . . Cut Deadweight of Moore Truck Bodies

The Moore Body Company of Reading, Pa., builds truck bodies for the mining industry where equipment really takes a beating. Moore has standardized on J&L Jalloy heat-treated plate to "armor" its truck-body bottoms against impact and abrasion.

The reason:—J&L Jalloy has a yield strength and Brinell hardness four times as great as mild steel. This makes it possible to cut deadweight by reducing plate thickness, and at the same time increase service life through Jalloy's high strength and wearing qualities.

For example, in Moore Body Company's 9 cu. yd. stripping body, 3/16" Jalloy has replaced 1/4" mild steel, and yet Jalloy's strength and hardness ensure increased resistance to abrasion and impact. Most important to cost-conscious mining men who must replace worn out truck beds—J&L JALLOY LASTS FOUR TIMES AS LONG AS MILD STEEL YET IT COSTS ONLY TWICE AS MUCH.

It's easy to see why more and more progressive mining companies have found that J&L Jalloy can do a dollar-saving job in such applications as chute liners, bulldozer blades, shovel buckets, and other places where impact and abrasion limit the life of equipment.

If you're responsible for the economical operation of earth-moving or handling equipment, you'll profit by writing for a free copy of our booklet, "For Longer Wear . . . Less Repair." It gives you complete information about J&L heat-treated Jalloy plate and shows you how others are saving money with this modern mining and quarrying steel.

Jones & Laughlin Steel Corporation
412 Jones & Laughlin Building
Pittsburgh 30, Pa.

Please send me a free copy of your booklet, "For Longer Wear . . . Less Repair—Jalloy, J&L Special Alloy Steel."

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

Farval provides perfect lubrication for world's largest tin dredges

THE bearings on the digging ladders of these dredges are subject to heavy shock loads and continuous vibration. For days at a stretch they are immersed in corrosive salt water, in the excavation of tin bearing sand. Yet the bearings function perfectly because each one is protected by a tough, unbroken film of lubricant supplied by Farval Centralized Lubricating Systems.

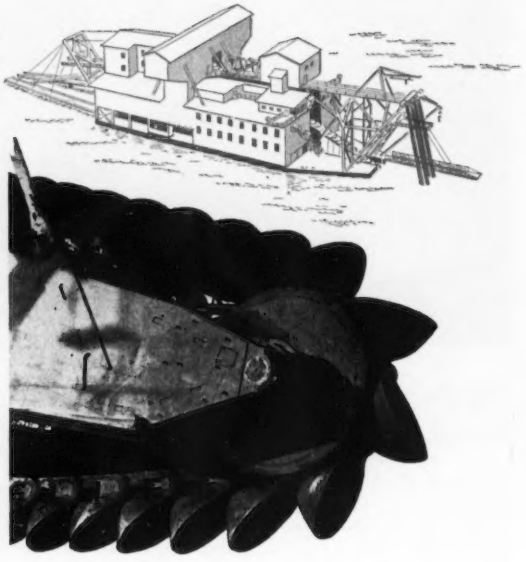
The tin dredge pictured here is one of nine such Farval-protected giants operating in the Dutch East Indies. Its digging ladder is 216 feet long, operates 100 feet under water. The super structure stands as high as a 9-story building. Other similar recently built mining dredges, lubricated by Farval, dig for gold in Africa, Russia and the American west—nearly a score in all.

Where expensive, heavy-duty bearings must function continuously under heavy loads, or in any difficult conditions—where success depends on adequate protection of bearings—there you'll find Farval on the job. On thousands of machines all over the world, Farval Centralized Lubrication has long since proved its ability to save labor, lubricant and time, eliminate delays, reduce maintenance expense and repairs, and increase production.

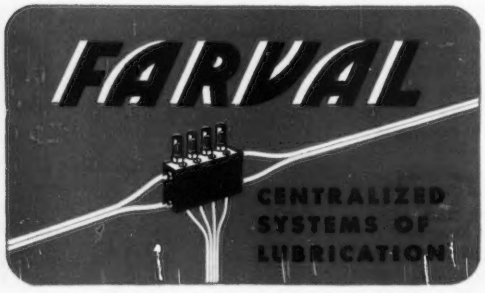
Farval is the original (patented) Dualine system of centralized lubrication that has proven itself through years of service. The Farval valve has only two moving parts—is simple, sure and foolproof, without springs, ball-checks or pinhole ports to cause trouble. Through its full hydraulic operation, Farval unfailingly delivers grease or oil to each bearing—as much as you want, exactly measured—as often as desired. Indicators at every bearing show that each valve has functioned.

Write for Bulletin 25 for full details. The Farval Corporation, 3281 East 80th St., Cleveland 4, O.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



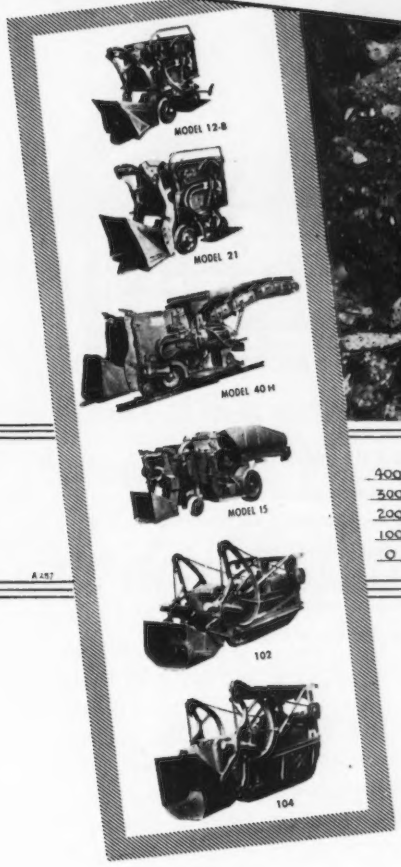
FARVAL — *Studies in Centralized Lubrication* No 114

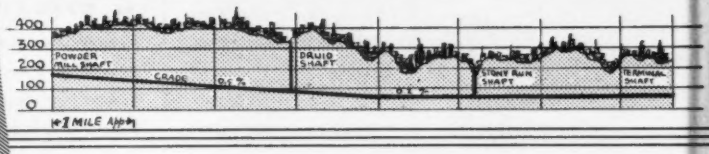


CASE HISTORY OF A SUCCESSFUL TUNNEL JOB

FROM THE EIMCO FILE T190

BALTIMORE TUNNEL





SPECIFICATIONS

Length of this section of tunnel—7 miles.
Size heading—7' (3 miles) 10' (4 miles).

Headings worked—6 — Advance, average 2500' per month, maximum 5000' per month. 32 hole 9' round drilled. 150 to 225 pounds of 40 or 60% powder (depending on rock) per round. Average about 7 pounds per cu. yd. of rock broken. Mucking time average 1 hour, 15 minutes. Mucking machines—Model 40 Eimcos.

The contractor responsible for driving high speed rock tunnels is required to be many things—a competent engineer, a geologist, a mechanic, an expert in labor relations and all of the other skills which the inevitible uncertainty of this work presents.

He must, therefore, be exacting and doubly cautious in his selection of machines. There can be no questions, no uncertainties about the machines doing their jobs, no matter how tough the going.

This is the reason you will find Eimco machines on the big majority of tunnel jobs the world over. There are no uncertainties when you have an Eimco loading out the round. It is fast, safe and low in cost regardless of conditions. You can't beat an Eimco for absolute dependability.

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ENGINEERING AND MINING JOURNAL

production for defense

IN ITS ALL-OUT EFFORT to meet the nation's mineral requirements, the mining industry needs every bit of information on improved methods and equipment for every step in mining, from exploration to refining.

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"Production for Defense" will show how to increase production and lower costs in

1 UNDERGROUND MINING

By Integrating the Entire Mining Operation for Greater Productivity.
By Use of Safer, Less Expensive Ground Support.
By Faster Drilling, at Lower Cost.
By Faster, More Effective Loading Methods.
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By Improved Low-Cost Air Compression and Distribution.
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By Efficient Use of New Materials.
By Use of Better Methods, Better Reagents.
By Effective Materials-Handling Methods.

4 SMELTING AND REFINING

By Use of Efficient High-Capacity Techniques.
By Increased Economy of Labor.
By Increased Economy of Fuel and Supplies.
By Development of New Methods.
By Use of Better Measurement and Control Devices.
By Cutting Down Stack Losses and Smoke Damage.
By Better Materials-Handling Methods.

The July issue of ENGINEERING AND MINING JOURNAL, "Production for Defense," is an unusual opportunity for manufacturers to tell the metal and nonmetallic mining industry how their products can increase production or lower costs.

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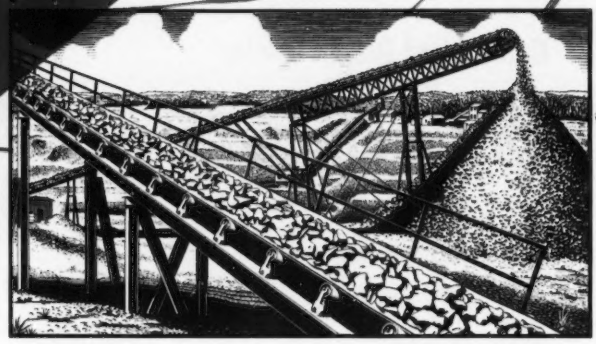

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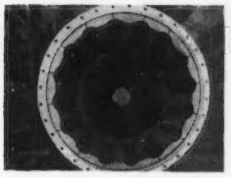

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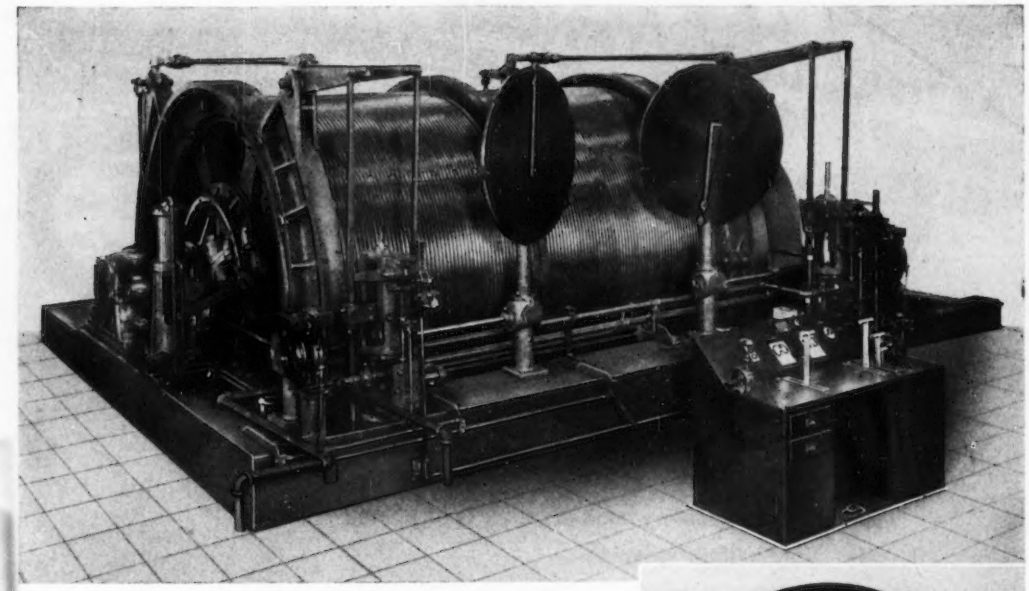

This Modern Mine Hoist

is equipped with a

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When installed, it will be driven by dual 250 hp. motors through flexible couplings and single-reduction herringbone gears running in oil. The main shaft and both of the two pinion shafts are mounted in spherical-roller-bearing pillow blocks to minimize friction and assure permanently accurate alignment. All operating levers and instruments are grouped at a control desk on the floor level, providing SIMPLIFIED EFFORTLESS CONTROL.

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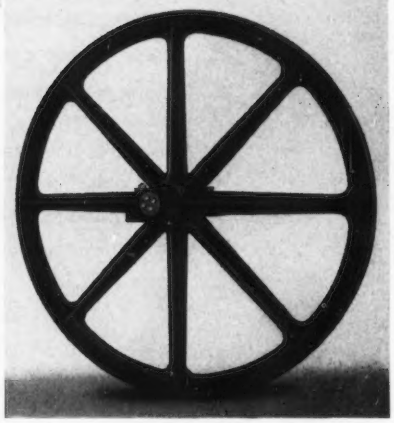
The all-steel "built-up" drums are 10'-0" diam. by 6'-2" face with machine-cut grooves for 1609 feet of 1⅜" rope in one layer. Each drum is equipped with a gear-driven safety controller which provides complete protection for hoisting from several different levels.

Your operating conditions may require an entirely different type of hoist but Vulcan's experienced engineers will welcome an opportunity to submit an equally suitable design. No charge or obligation—just give us the necessary data.



VULCAN ALLCASTEEL SHEAVES
WITH ROLLER BEARINGS

were furnished for use with this hoist and for other hoists operated by the same company. The sheave here illustrated is 10 ft. pitch diam., grooved for 1⅜" rope and equipped with tapered roller bearings in the hub. The "dead" shaft is held in clamp-type steel pedestals. Light, strong, true-running and so highly resistant to rope wear that NO LINERS ARE NEEDED, Vulcan Allcasteel Sheaves have proved their money-saving superiority for every type of heavy-duty service. Bulletin A-396 (20 pages, fully illustrated) gives complete information.

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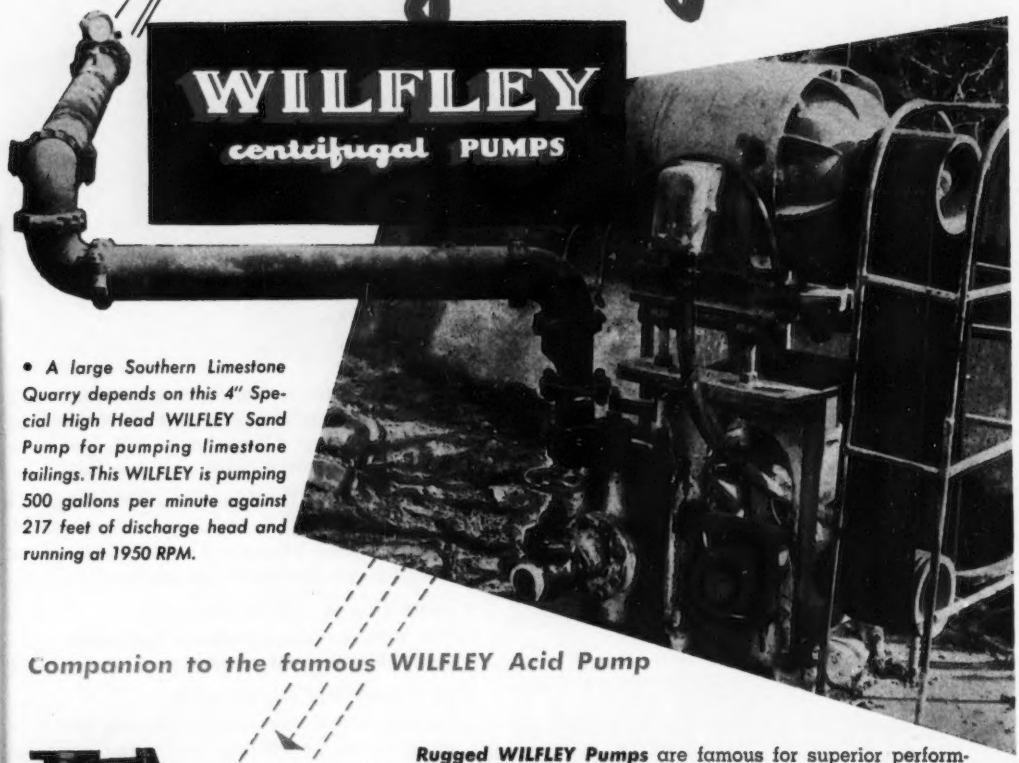

• *A large Southern Limestone Quarry depends on this 4" Special High Head WILFLEY Sand Pump for pumping limestone tailings. This WILFLEY is pumping 500 gallons per minute against 217 feet of discharge head and running at 1950 RPM.*

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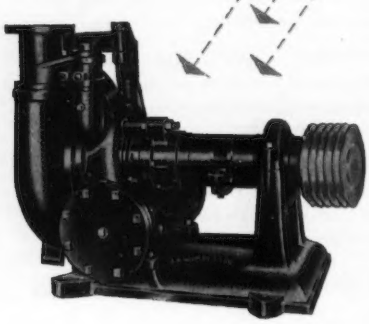

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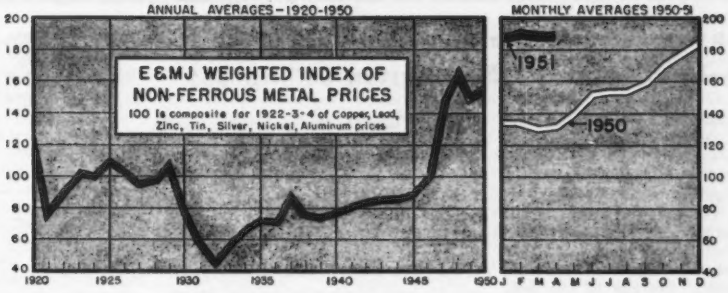
PRICES



●

MARKETS

The RFC's continued intervention in the tin market to try to hold the price down shaved a minute 0.01 point off the E&MJ index of non-ferrous metal prices last month. Our April index is 190.18, against March's 190.19. Other metal prices were nailed down by the ESA.

Copper, lead, and zinc are getting shorter all the time. The reason is still that imports are falling off, owing to higher prices paid elsewhere.

Tungsten experts look for general increase in production, encouraged by the $63 floor. New mines have already opened up and old mines are rapidly increasing production. (See p. 76.)

●

LABOR

Labor's clear victory on wage stabilization may hurt Charles Wilson, defense production chief. Labor, against Wilson's wishes, wanted an expanded wage "stabilizing" board, with power to muscle into labor disputes, and got it, almost as ordered. Wages are bound to go up.

●

AT HOME

Considering the general confusion in Washington, the Defense Minerals Administration has done well to get as far as it has. But no matter what happens in DMA, don't expect Big Democracy ever to develop rapid-fire techniques, short of all-out war.

Nevertheless, **mining's prospects are fine.** Despite slackening in some business lines, mounting defense orders will keep mines humming.

Agreement in Congress on **suspending the copper tariff,** as long as the price stays above 24¢, probably clears the track for similar action on lead and zinc, which is already in the mill.

The ground rules set up around the **guaranteed price for tungsten** (See p. 104.) indicate that the Government is no nearer finding simple solutions than ever. Strong pressure still exists for preferential subsidies rather than flat prices as production incentives.

Add the joint **Hecla-Hewmont-New Jersey Zinc** million-dollar Atlas project to the list of deep explorations in the Coeur d'Alenes. If it clicks the Silver Belt will be productive clear to the Montana line.

●

ABROAD

With granting by the U.S. of a 3¢ increase in the price paid for Chilean copper, one more reason arises for a Metals Reserve type of buying of foreign metals for resale to U. S. consumers at ceiling prices. How else will this increase be paid without raising the ceiling?

MARKETS—Trends and Prices

Defense Program Absorbing Larger Tonnages of Metals—Lead Imports Off—Tungsten Ceiling $65

WITH THE DEFENSE PROGRAM absorbing increasing tonnages of strategic materials, the supply situation presented even more of a problem in April than in the preceding months of the year. Even lead, which at the outset of the year appeared to be in a fairly comfortable position, has come under control in that use has been restricted to the monthly average of the first half of 1950. The National Production Authority announced its Controlled Materials Plan under which three basic metals—steel, copper and aluminum—will move into defense and essential needs based on known requirements.

Price changes were few. Tin was unsettled, with RFC the chief seller. A ceiling price of $65 per short ton unit of WO_3 was named for tungsten ore. The New York equivalent for antimony ore advanced slightly because of the recent rise in freight rates. Quicksilver dropped $3 per flask. The E & MJ index of prices was virtually unchanged at 190.18 for April, against 190.19 in the preceding month.

Under the Controlled Materials Plan the distribution of the limited supply of copper that will be available to general industry after essential needs have been provided for is expected to present a serious problem to producers. Producers, anticipating trouble, have urged NPA to take over the complete allocation of the metal after July 1. It was estimated in some quarters that between 60% and 70% of the available supply will be absorbed in defense and defense-supporting production. Until the defense needs under CMP are known, NPA officials refused to take a stand on this request. With manufacturers encountering difficulty in placing "DO" business, officials in Washington have informed producers that they are to set aside 5% of their May and June output for emergency requirements.

Replacing the general price freeze of last January, the Office of Price Stabilization issued CPR 22—Manufacturers' General Ceiling Price Regulation. The order directs manufacturers to base their new ceiling prices on the highest prices charged between April 1 and June 24, 1950, with some exceptions on hardship cases. The order does not apply to primary metals, most of which are or will be controlled separately. The effective date of CPR 22 is May 28, 1951.

The copper industry learned that an agreement has been reached between representatives of the Chilean and United States government in the matter of paying a higher price for metal mined in that country. The "bonus" was generally placed at 3c. per pound. Pricing officials hope to pass on this increase without disturbing the going market price for copper of 24½c. per pound. It was thought in market circles that the higher price may take the form of a subsidy.

The bulk of the supply of copper, continued to move to consumers' plants on the basis of 24½c., delivered. In the outside market prices on scattered lots varied all the way from 35c. to 45c. per pound.

Fabricators in the United States obtained 324,406 tons of refined copper in the Jan.-March period. In the same period approximately 37,000 tons was shipped to the Government's stockpile.

World output in the first quarter showed a moderate gain. Production of crude by the group reporting to Copper Institute, which excludes Russia and a few countries of lesser importance, in tons:

Combined Totals, Crude

	Jan.-March 1950	1951
Primary	546,099	586,501
Secondary	37,599	15,266
Totals	583,698	601,767

Production of crude (secondary) by custom smelters was down sharply because of a diversion of scrap to makers of secondary ingot and other consumers able to pay more for this material under price control. This "unfair" regulation is in process of revision.

With imports of lead declining sharply, consumers are hard-pressed in obtaining supplies to take care of an expanding market. NPA has moved in to regulate the supply-demand situation in lead by amending order M-38. Restrictions on use were necessary because imports are expected to drop by 146,000 tons this year, NPA officials said. W. B.

Average Prices for April (E&MJ Quotations)

Copper:	
Electrolytic, Domestic, Refinery	24.200
Electrolytic, Export, Refinery	24.425
Lead:	
Common, New York	17.000
Common, St. Louis	16.800
Silver and Sterling Exchange:	
Silver, New York, per oz.	90.160
Silver, London, pence per oz.	78.500
Sterling Exchange, "Checks"	280.000
Zinc:	
Prime Western, East St. Louis	17.500
Tin:	
New York Straits	145.735
New York, 99% min. (e)	144.735
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$215.600
Antimony (E&MJ) (d)	45.298
Antimony, bulk, Laredo	42.000
Antimony, in cases, Laredo	42.500
Platinum, refined, per oz.	$90.000
Cadmium (a)	255.000
Cadmium (b)	267.500
Cadmium (c)	280.000
Aluminum, 99% plus, ingot	19.000
Magnesium, ingot	24.500
Nickel (f)	50.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotation
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included

No Changes Planned in Quotation Basis

Because of the large imports of non-ferrous metals, the editors of *Engineering and Mining Journal* sent an inquiry to a representative list of large and small mine operators and smelting companies to ascertain if it would be generally desired to include imported metal in our quotational basis, or to publish separate quotations for imported metal.

In the replies, an overwhelming majority insisted that the present quotations should be retained. A considerable portion asked for separate quotations for foreign metal. However, because our quotations on the major metals reflect actual sales, we can only publish them when the parties to transactions will give us the tonnages and prices. In our efforts to institute quotations for foreign metal sold in this market, we were refused the data on sufficient tonnages to make it possible to publish truly representative quotations.

We shall continue, however, to indicate in our summary of the market the prices at which foreign metal is sold to domestic consumers when information is available.

Clancy, head of lead sales of A. S. & R. Co., declared at a meeting of battery manufacturers that imports may decline to about one-half of last year's total, or to approximately 260,000 tons. The price here was maintained at 17c., New York, whereas prices paid abroad varied between 19c. and 22c. per pound.

Despite the control measures, demand for zinc continued well in excess of supply. Production of slab zinc in the United States during March totaled 80,450 tons. Deliveries totaled 80,462 tons, of which domestic consumers obtained 70,845 tons, exports absorbed 5,916 tons, and the Government took 3,701 tons. Stocks in the hands of smelters on March 31 were abnormally low at 11,105 tons. The ceiling price here continued on the basis of 17½c. for Prime Western, East St. Louis. In the foreign market quotations were nominal at 29c. per pound and upward. This means that larger tonnages of foreign concentrates will move to the higher market.

Tin importers asked for relief from existing NPA regulations that virtually turns over the entire business of buying and selling the metal in this market to the RFC. The Government's agency set the price over most of April, holding to $1.42 per pound on Grade A since the 17th of the month. An interim contract with Bolivian ore producers was agreed to by RFC. Settlement is based on the price of tin prevailing in Singapore.

A ceiling price of $65 per short ton unit of WO_3 was announced by OPS, effective April 6. The high price was set to encourage production from low-grade ores. In the World War II period the price was stabilized at $24. New uses for tungsten call for extra supplies.

Manganese and chrome ore prices were firmer on advancing freight costs.

(*Continued on page 103*)

Major Metals

U. S. DAILY AND AVERAGE PRICES

April 1951	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis	April 1951	Sterling Exchange "Checks"
2	24.200	24.425	150.500	17.000	16.800	17.500	2	280.000
3	24.200	24.425	149.500	17.000	16.800	17.500	3	280.000
4	24.200	24.425	150.000	17.000	16.800	17.500	4	280.000
5	24.200	24.425	149.875	17.000	16.800	17.500	5	280.000
6	24.200	24.425	150.000	17.000	16.800	17.500	6	280.000
7	No Market	24.425	150.000	17.000	16.800	17.500	7	(e)
9	24.200	24.425	150.500	17.000	16.800	17.500	9	280.000
10	24.200	24.425	150.500	17.000	16.800	17.500	10	280.000
11	24.200	24.425	150.500	17.000	16.800	17.500	11	280.000
12	24.200	24.425	147.000	17.000	16.800	17.500	12	280.000
13	24.200	24.425	147.000	17.000	16.800	17.500	13	280.000
14	No Market	24.425	147.000	17.000	16.800	17.500	14	(e)
16	24.200	24.425	147.000	17.000	16.800	17.500	16	280.000
17	24.200	24.425	142.000	17.000	16.800	17.500	17	280.000
18	24.200	24.425	142.000	17.000	16.800	17.500	18	280.000
19	24.200	24.425	142.000	17.000	16.800	17.500	19	280.000
20	24.200	24.425	142.000	17.000	16.800	17.500	20	280.000
21	No Market	24.425	142.000	17.000	16.800	17.500	21	(e)
23	24.200	24.425	142.000	17.000	16.800	17.500	23	280.000
24	24.200	24.425	142.000	17.000	16.800	17.500	24	280.000
25	24.200	24.425	142.000	17.000	16. 00	17.500	25	280.000
26	24.200	24.425	142.000	17.000	16.800	17.500	26	280.000
27	24.200	24.425	142.000	17.000	16.800	17.500	27	280.000
28	No Market	24.425	142.000	17.000	16.800	17.500	28	(e)
30	24.200	24.425	142.000	17.000	16.800	17.500	30	280.000
	AVERAGES FOR MONTH							
April	24.200	24.425	145.735	17.000	16.800	17.500	April	280.000
	AVERAGES FOR WEEK							
April							April	
4	24.200	24.425	149.500	17.000	16.800	17.500	4	280.000
11	24.200	24.425	150.229	17.000	16.800	17.500	11	280.000
18	24.200	24.425	145.333	17.000	16.800	17.500	18	280.000
25	24.200	24.425	142.000	17.000	16.800	17.500	25	280.000
	CALENDAR WEEK AVERAGES							
April								
7	24.200	24.425	149.979	17.000	16.800	17.500		
14	24.200	24.425	148.750	17.000	16.800	17.500		
21	24.200	24.425	142.833	17.000	16.800	17.500		
28	24.200	24.425	142.000	17.000	16.800	17.500		

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

April 1951	Silver (c) New York	Silver London	Gold London	Gold (d) United States
2	90.160	78.500d.	248s.	$35.00
3	90.160	78.500d.	248s.	35.00
4	90.160	78.500d.	248s.	35.00
5	90.160	78.500d.	248s.	35.00
6	90.160	78.500d.	248s.	35.00
7	(e)	(e)	(e)	35.00
9	90.160	78.500d.	248s.	35.00
10	90.160	78.500d.	248s.	35.00
11	90.160	78.500d.	248s.	35.00
12	90.160	78.500d.	248s.	35.00
13	90.160	78.500d.	248s.	35.00
14	(e)	(e)	(e)	35.00
16	90.160	78.500d.	248s.	35.00
17	90.160	78.500d.	248s.	35.00
18	90.160	78.500d.	248s.	35.00
19	90.160	78.500d.	248s.	35.00
20	90.160	78.500d.	248s.	35.00
21	(e)	(e)	(e)	35.00
23	90.160	78.500d.	248s.	35.00
24	90.160	78.500d.	248s.	35.00
25	90.160	78.500d.	248s.	35.00
26	90.160	78.500d.	248s.	35.00
27	90.160	78.500d.	248s.	35.00
28	(e)	(e)	(e)	35.00
30	90.160	78.500d.	248s.	35.00
	AVERAGES FOR MONTH			
April	90.160	78.500d.	—	35.00
	AVERAGES FOR WEEK			
April				
4	90.160	—	—	—
11	90.160	—	—	—
18	90.160	—	—	—
25	90.160	—	—	—

Calendar week averages, New York Silver: April 7th, 90.160; 14th, 90.160; 21st, 90.160; 28th, 90.160.
(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound.

Quotations for zinc are for Prime Western brands. Zinc in New York commands a premium over the St Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are for domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fraction of a cent fractions per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic and Treasury silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Luljen

» **Contrary to traditional male opinion,** life isn't all beer and pretzels for the little woman who stays at home all day while you presumably are earning a living. The National Shoe Institute estimates that the average housewife walks 7½ miles per day. For comparison, stenographers have a 6-mile average, while salesgirls and waitresses average 8 and 12 miles respectively.

» **This is strictly** an unofficial report, but the annual meeting of the Canadian Institute of Mining & Metallurgy was a humdinger. Technical sessions were generally of high caliber but if we had any blue ribbons to hand out, they would be delivered as follows:

To B. S. Crocker, whose easy familiarity with the subject made his interesting and informative discussion of pebble milling at Lake Shore seem almost off the cuff (and those movies of the inside of a pebble mill in action were excellent).

To T. E. Hawkins, whose lively presentation of a very provocative subject, Hollinger's Industrial Relations program (*E&MJ*, April, 1951), kept a capacity audience completely absorbed.

To the Rhodesian copper producers whose motion picture about their operations indicates how effective that technique could be in informing the public of mining problems and in teaching mining methods to students or miners.

These mythical blue ribbons of course represent only one man's opinion. We also felt that some otherwise good papers suffered by lifeless presentation and that some stimulating information was often drowned in a deluge of inconsequential detail.

The social aspects of the meeting left nothing—absolutely nothing—to be desired. The program was so full, we simply disappeared into the Chateau Frontenac on Monday and didn't emerge for three full days. Of course disappearing in the Chateau isn't difficult. That spacious hotel makes an extremely pleasant home away from home. But except for a rather shady establishment in Tientsin, China, it's the only hotel we know of where room numbers are based on sheer whimsy. Room 5320 is on the 3rd floor, room 4620 is on the 6th floor. Some chap who spent the entire meeting muttering over a 24-in. slide rule finally decided that there was some scientific basis to the numbering system, but by then it was too late. Most people solved navigation problems in the corridors by taking a backsight on the elevator shafts and a foresight on the distant sounds of revelry, a mile and three-quarters down the winding corridor.

To the visitor though, the CIMM meetings are significant chiefly on two counts. First, despite an occasional dig at each other, Canada-U.S. relations make a wonderful example for the rest of the world. Secondly, they are an annual reminder of the vast potential of Canadian mining. Despite their tremendous development during the last 20 years, Canadian mining men will assure you that their industry is only standing at the threshold.

"I t-told you this last level was t-too deep."

» **E&MJ got a letter** last month from F. W. McQuiston, Jr. He's deputy manager of the Raw Materials Division of the AEC. The first sentence referring to the article on the Monticello mill in the March issue was rather nice. Thereafter, Mr. McQuiston showed just cause why we should make it clear that no censorship whatsoever was involved in the AEC's reviewing of the article—as we had hinted in this column with all the subtlety of a train wreck.

As a matter of fact, we recall that Mr. McQuiston was kind enough to arrange for Mr. Butler to prepare the article. He points out in his letter that when he received the article for review he " . . . suggested some changes and deletions in the interest of accuracy and clarity," but " . . . there were no deletions for security reasons."

Let's hope this clears up any false impressions. All we can say is that the use of a razor blade on the manuscript faked us right out of position.

» **Things are really hot** in the brimstone business these days. Somehow word got around to Congress, Drew Pearson, et al., that sulphur may soon be scarcer than good deeds in the Kremlin. Reactions ranged from utter complacency to utter indignation. To set the record straight, we have called upon Langbourne Williams, president of Freeport Sulphur Co., and whose business it is to know the sulphur business. Check page 87 for the answers on the sulphur situation.

Mr. Williams doesn't report on it, but maybe the answer to any sulphur scarcity lies in the Libyan desert. It has been discovered recently that certain lakes there contain bacteria that reduce hydrogen sulphate to hydrogen sulphide. Organisms were also found that produce sulphur from the sulphide. One organism deposits it inside the cell while the other deposits it outside. The latter type has caused the formation of a 6-in. layer of sulphur on a lake bottom. If production can be increased ten times, a commercially feasible process can result.

ENGINEERING AND MINING JOURNAL

MAY, 1951

This Is the Most Dangerous Year

DON'T RELAX. The next few months are far more dangerous than those last fall, when our troops were fighting desperately to hold a beachhead in Korea. There is absolutely no basis for complacency.

The American people, having no tradition, inclination, or economic incentives toward militarism, simply are not adapting themselves to the disciplines of an arsenal economy. We have learned to think of war as a dramatic interlude, to be played full tilt, or not at all. It should be our present concern to prevent this meteoric disposition from becoming an Achilles' heel.

If you think that the Soviets won't fight an all-out war, just consider that their actions in Asia clearly assume that risk. Consider that they have flatly stated they will not tolerate Western German rearmament—and preparations are being made to arm that country. Also, they have made it known unofficially that they will openly participate in the Korean conflict if we attack the bases in Manchuria now treated as "out of bounds" by our forces.

If you think there is any possibility of the Soviet Union becoming sincerely peaceful during the next 10 years, pause to consider the Marxist doctrine which they espouse, the intent to destroy capitalism that they have been shouting from the housetops at home for 30 years, and the expensive fifth columns which they have persistently supported in numerous foreign countries even though the funds could be very well used at home. Consider the enormous armed forces which they continue to maintain at great cost, even though nobody meditates an unprovoked attack on them.

The one and only thing that can avert war with such a conspiratorial, fearful, aggressive power is the existence of sufficient ready armed strength in the Western World to make it an uninviting target.

The most dangerous period is the remaining months of 1951. During that time, unless we relax to an extent that convinces them we can be "taken" by infiltration and subversion, the Soviets will have the force available to create havoc in the Far East, to take Western Europe without serious resistance, and to damage our industrial and population centers severely by air attack. Knowing that from this time forward their chances of making large initial gains will lessen as our armament improves, they will have great temptation to precipitate full-scale war.

Also, there are signs that several European nations may be on the verge of financial crisis. If such crises develop, nothing could be more conducive to a Soviet decision to march than a confused, weakened Europe, and a United States riven with indecision and unwillingness to accept the disciplines of an arsenal economy.

The defense program is sound and we risk a national tragedy if we cut below it or stretch it out, no matter how calm the international front may seem. The architects of the program, chiefly Secretary of Defense Marshall and Mobilization Director Charles Wilson, are deeply concerned about the cost and have already cut the program to the minimum level consistent with reasonable safety.

Moreover, don't relax if the prospects of full-scale war seem to diminish in the next few months. On the one hand, if the Soviets decide to fight, they will be most reassuring in the weeks just preceding an attack. On the other, if the faction in the Kremlin that believes we can be undermined by infiltration and subversion should prevail, the circumstances that would help them most to gain their ends would be continued indecision, factionalism and unwillingness to face up to the problem of inflation in the free world. Many of our national leaders consider our reluctance to face discipline as our most vulnerable spot.

Therefore, whether you fear direct attack or infiltration and border conflict by the Soviets, in either case there is no basis for complacency. Support the defense program! Do everything you can to arouse your community and to stiffen the spines of politicians over the danger of inflation! The stakes are large and the costs of conforming to these suggestions, high as they are, are small compared to what relaxation will invite!

Minerals Are Required

Here are some bench marks for surveying your future—what Washington plans, what help Government will give, and the economic climate that is in prospect.

THE DISTURBING THING about the growing complacency that is abroad in the country today—and pervades every corner of Washington—is that six months ago any competent strategist in the Kremlin would have planned to foster exactly this state of mind.

Who can say that developments are not working out according to plan, from the Kremlin's viewpoint? Aroused by the Korean outrage into a mobilization sufficiently large to become internally destructive if it should find no target at which to be launched, our defense leaders soon perceived that the nation's best interests involve building the minimum armament commensurate with safety and preparing to hold out for the long pull. They reasoned that our present "security" is based on our strength and Soviet weakness in atomic weapons, but that Soviet weakness might be altered sufficiently in two years to make the communists disregard our advantage if we should remain otherwise wide open to attack. Thus our leaders planned that in two years we must have an armed force of 3,500,000 well-equipped men, all the munitions that we could transport to combat areas in a year of all-out war, and an adequate contribution to the self-defensive efforts of other nations in the free world. Beyond this, they wanted no cumbersome surplus of munitions to grow obsolete and break our backs economically in the making. This program would take a maximum of about $50 billion per year for defense production. After the two-year program would have achieved the minimum safe level, the mobilization effort could be relaxed to a level commensurate with the rate of obsolescence and the outlook at that time. Meanwhile, there must be no faltering of the two-year program.

Obviously in the face of such a program, clever strategy on the part of the Kremlin would be to throw this well-reasoned program off balance, either by bogging it down, or, without provoking war, by needling us into expenditures that would throw our economy into an inflationary tailspin. If this is the Russian strategy, it has had some measure of success in both directions. Complacency is bogging the program down. Not provocation, but indifference and political cowardice are bringing us to the brink of an inflationary precipice. Diabolically, there is no particular individual or group responsible for this relaxation. The complacency which fosters it pervades the entire Administration, the entire Congress, and the whole country. What worries our topside strategists most is their fear that our relaxation, far from being a basis for comfort, proves that Moscow is winning this round. They are disturbed at the slowdown in the defense program and profoundly alarmed at the drift and indifference toward inflation. By a queer twist of fate, it is the military group, characteristically the most profligate spenders from the public purse, who today are most concerned over the weaknesses in our economic structure.

Confusion Compounded

It was inevitable that there would be much confusion in the process of gearing a giant democracy for defense. That was "in the wood" for the elephantine town meeting that we call a Federal Government. The scaling down of the earlier too grandiose ideas multiplied the confusion. The adjustment to popular relaxation and politics as usual continues the multiplication. At this time it is impossible to predict when, if ever, the program will stabilize or the shape it will take. For example, two months ago regulation of industrial activity under a Controlled Materials Plan was stated to be a certainty. More recently, after a week of deliberation over the alternatives of no CMP, an "open-ended" CMP applying solely to military and defense-essential programs, and a full CMP, an open-ended plan was gingerly announced. To believe that this will be a final solution is to ignore all the lessons of World War II that demonstrated how controls breed controls.

As another example of instability, the few projects that a harassed Defense Minerals Administration had ground through its mill by late March were being carefully screened by Defense Production Administration under the concept, "Is this necessary?" the high command seemingly being chiefly concerned over holding the mobilization effort within shrinking bounds. The earlier concern over possible raw-material deficiencies had changed into a fear of stimulating overproduction. Only in early April did the first DMA production stimulation contract clear through DPA.

Minerals Needed

However, in spite of the general drift toward business and politics as usual, there is still an inclination to foster mineral raw-material production, particularly the metals, and most particularly the "glamour" metals needed for jet propulsion and electronic equipment, such as nickel, cobalt, and tungsten. In this still changing picture, there seems no liklihood of a new general production subsidy for copper, lead, and zinc,[1] and Government financial assistance to projects involving these metals will probably be limited in comparison to expectations a few months ago. On the other hand, the recently declared five-year floor price for domestic tungsten illustrates the continued ex-

[1]The more likely basis for subsidies is to hold manpower in defense-essential mines. If created, payments will be on a basis of individual financial need.

Despite Defense Slump

pansionist attitude toward strategic materials in short supply.

The Defense Minerals Administration has been handicapped in the procurement of personnel by lackadaisical cooperation from a nevertheless - quick - to - criticize mining industry. It has been plagued with political interference and the general slowness in the clarification of objectives; also by the interminable ring-around-the-rosy of checking projects and policies with other agencies. Thus by mid-April, only 18 procurement contracts had been cleared through the DMA mill. However, none of these had secured the approval of both the Defense Production Administration and of the General Services Administration, so that money could actually be paid out.

DMA Progress

Nevertheless by mid-April there were signs of progress in DMA. It had cleared 61 applications for accelerated amortization. New, shorter, more appropriate application forms were near approval. Working, if not final, objectives had been set up for most minerals. The Interior high command had delegated authority to act to Administrator James Boyd, thus removing one of the chief sources of delay. However, the reins of decisive power had been pretty well gathered into Defense Production Administration, leaving DMA and many other agencies with only scrutinizing and recommending functions. The routine of procedure was still cumbersome enough to arouse serious doubt that effective results can be gained until the sprawling organization for defense production is made more compact and brought under more centralized control.

Production Program

The program being shaped up by DMA to encourage mineral production has four phases, which will be utilized in order and only to the extent necessary to accomplish the objective for each mineral. The first is accelerated amortization, which is granted on a percentage of the investment deemed commensurate with the project's essentiality to defense. The second is purchase contracts on an individual basis. In copper and aluminum, for example, it is believed that these steps will be adequate. In cases where the number of producers or potential producers is large and the defense needs for expansion are urgent, the scheme recently applied to tungsten—a long-term guaranteed minimum price to new domestic production—will be employed. A fourth step, not in actual use at present but available in appropriate cases, will be RFC or Government-guaranteed private loans. Unless the Defense Production Act is changed with respect to its mandate to encourage private financing, the RFC loans will probably be but little used. In most instances, meritorious projects can be financed privately if the promoter or operator has a long-term purchase contract or guaranteed price.

Exploration Aid

Also a $5,000,000 program for domestic exploration assistance has been worked out. This will be applied on an individual contract basis and to an extent appropriate to the minerals involved and the merits of the applicants and projects. In the case of copper, lead, zinc, chromium, iron, fluorspar, graphite, molybdenum and sulphur, Government will put up 50% of the risk money[2] for approved projects, repayable out of future production, but not repayable if the Government decides that the exploration was unfruitful. The repayment obligation would have a 10-year term and would then lapse, so that a property of doubtful worth would not be encumbered indefinitely with a Government lien. In the case of antimony, manganese, mercury and tungsten, Government will advance 75%, and 90% in the case of asbestos (spinning grade), beryl, cobalt, columbite-tantalite, corundum, cryolite, industrial diamonds, kyanite, strategic mica, monazite, uranium, rare earths, nickel, platinum, quartz crystals, steatite, and tin.

[2]The applicant can consider his own labor at reasonable rates as part of his share.

Administration Important

The initiated will quickly realize that the liberality and the soundness of such a scheme will depend as much on its administration as on its "ground rules." If the field examination of projects is highly competent and assistance is given only in proportion to prudent appraisals of actual needs and characters, it should be possible to achieve both a sound program and real assistance to the deserving. On the other hand, if field examinations become perfunctory or otherwise incompetent, or if the capabilities and characters of applicants are not carefully scrutinized, the ground rules could permit a scandalous result. That pressures exist to set up a "gravy train" is evident from the dissatisfaction that has been shown with the established ground rules, from the Congressional efforts to introduce less restrained subsidies, and from the grillings that committees of both Senate

Don't Rush to Washington

If you have a mineral-development problem for which you seek Government assistance, do not rush to Washington in the hopes of expediting consideration. So many applicants have done this that talking to them has seriously hampered progress and has done them no good. Write to the nearest regional office of the Bureau of Mines (Juneau, Alaska; San Francisco, California; Spokane, Washington; Denver, Colorado; Joplin, Missouri; Minneapolis, Minnesota; Knoxville, Tennessee; or College Park, Maryland) for the necessary application blanks. Fill these out carefully and send them in. You will be asked to come to the regional office or to Washington for consultation whenever your presence there would be advantageous. Meanwhile, stay away and give the Defense Minerals personnel a chance to do useful work.

and House have given to officials concerned with development of the program.

Mine operators have enjoyed very substantial help toward obtaining equipment and supplies from the Requirements Division of DMA, under the able leadership of Harold Montag. The division has handled a large number of requests totaling hundreds of millions of dollars and involving 31 minerals. It has helped applicants either by direct intervention on an informal basis with suppliers or by obtaining spot assistance from the National Production Authority. It is able to give positive assistance for equipment and supply needs to producers of defense-essential minerals. Arrangements are being made to give mines special treatment as to maintenance, repair, and operating supplies on the basis of the urgency of need for the mineral produced. A special program for the steel requirements of mining machinery manufacturers has been set up, and when a Controlled Materials Plan is instituted, the needs of the mining industry and its approved expansion goals will be included in the CMP programs.

The manpower branch has been able to establish an effective liaison with the military services and has already been able to secure several hundred deferments for meritorious cases. A successful program is also under way in regard to access roads. By mid-April, 15 projects had been processed for certification and a program for $7,500,000 to be spent on access roads had been set up for fiscal 1952.

Stockpile Cutback

In order to ease the pressure of mineral shortages on the national economy, substantial cutbacks have been made in the rates of acquisition of at least copper and zinc for the national stockpile. This, however, does not mean that the ultimate goals have been reduced, except on a routine basis. The reported substitution of steel for brass in large-caliber cartridge cases, for example, may automatically cut very deeply into stockpile goals for copper and zinc, as cartridge brass is the largest single military use for these metals.

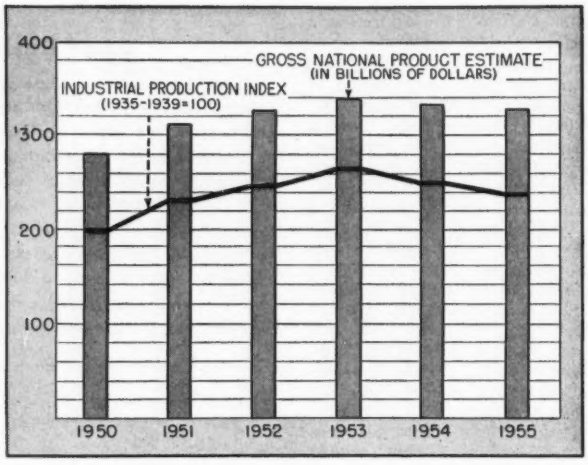
In the field of output regulation, the National Production Authority has been wrestling with its stopgap priority system — the "DO" ratings—hoping to hold things together until a Controlled Materials Plan could be instituted. It is now planned to begin at least a limited CMP on July 1, applying to military and defense-essential programs. The needs of mines producing essential minerals and manufacturers serving them will be included in this "open-ended" CMP.

The Controlled Materials Plan is primarily control of the basic materials, steel, aluminum, and copper. Manufacturers are asked to submit their proposed operating schedules and material needs, by quarters, in advance. The total requirements are then segregated into categories and studied with reference to the apparent total supplies of these 3 materials. Each category is then given a percentage of its requirements related to its essentiality in such a way that the totals allocated jibe with the total supplies. In relating its allocations to approved operating schedules, the plan prevents excess inventory accumulations and the issuance of priorities exceeding the total supplies.

Other materials in short supply and necessary to approved production programs will be provided in proportion to the needs of these programs either by direct allocation of a part of the supply or by the granting of priorities to favored producers.

The application of CMP only to defense-essential production will, of course, leave a large number of manufacturers in an outside competitive "scramble" for the remainder of the materials not allocated under CMP. NPA is still undecided how it will eventually prevent an intolerable mess of price pressures and black marketing. It hopes to hold this segment of the economy within bounds by inventory controls, end-use limitations, conservation orders, priorities, and other broad restraints. However, it is a good guess that

Price Declines? Overproduction? No!



OUR ABILITY TO CARRY an added defense burden of 20 to 30 billion dollars and maintain our established standard of living is indicated by these conservative estimates of our economic future.

WITH A SCALED-DOWN defense production program, stockpile-purchase cutbacks, "mushiness" developing in some consumer-goods markets, and hindering of public purchasing power by inflation, credit controls, and high taxes, many of our readers are no doubt wondering if price declines may develop in

On the Economic Side: THE CURVES POINT UP

the mineral markets in the near future. Also, they may have fear that expansion plans aimed at production three or five years hence may overshoot.

FOR THE NEXT TWO YEARS, we feel sure that if any soft spots develop, they will be of short duration. On top of a lively demand-full economy, we are raising annual defense expenditures by approximately $30 billion over the 1950 level of $22 billion. Even considering high taxes and living costs, it is impossible to have a depression under such circumstances, or an important letdown in prices of the materials whose supplies are the principal bottlenecks to further economic expansion. Buttressing this basic picture, we have unsatisfied stockpile requirements, imminent deferments of consumer wants in many hard-goods lines, strong demands for new housing, and impressive plans in the minds of industrialists for new capital investments. Therefore, we see no prospect of a serious letdown in mineral prices or slackening in demand in the next two years.

FOR THE LONGER TERM, the principal signs point to continued economic growth:

- **Even after** the "bulge" of defense production is over, it is anticipated that annual defense expenditures will remain at about $40 billion. It is inconceivable that they could sink below $20 billion—1950 was $22 billion.

- **No possibility** exists that the Soviet Union can change to a sincere non-aggressor within the next ten years. Thus, the rest of the world will have to remain armed for at least this decade. Armament calls for minerals.

- **The domestic economy** is still expanding, and the gross national product can be expected—apart from dollar values—to increase about 3% per year. Population is growing (170,000,000 in 1970) and rapid growth is in prospect for steel, power, petroleum, chemicals, and other heavy industries.

- **Expanded foreign demands are inevitable.** Armament or war will set up heavy requirements for minerals. But if we have peace, the long-term outlook is even more impressive. European industrial output is still far below par. All over the world people are determined to achieve greater material well-being—and are acquiring the means to succeed.

- **All over the world,** there is growing emphasis on raw materials. Recognition of their importance is creating less willingness to throw them on depressed markets. Burdensome surpluses are rapidly disappearing. This means distress price periods will be fewer and shorter. The world's basic raw-material problem is supply, not overproduction.

- **Another ten years** at present rates of production will make an important dent in ore reserves, thus calling for new sources of production, and probably higher prices.

- **The homes of the United States** are estimated to be only 25% fully equipped mechanically. Here is an enormous market to be satisfied with no important scrap returns. And the need for approximately a million new homes annually will continue for at least 10 years into the future.

[1] We estimate new houses to be constructed in the next 5 years at 5,500,000.

[2] The McGraw-Hill survey of business plans shows that industry will spend $21.5 billion for new plant and equipment in 1951 if not prevented by material shortages. Expenditures in 1950 were $14.8 billion.

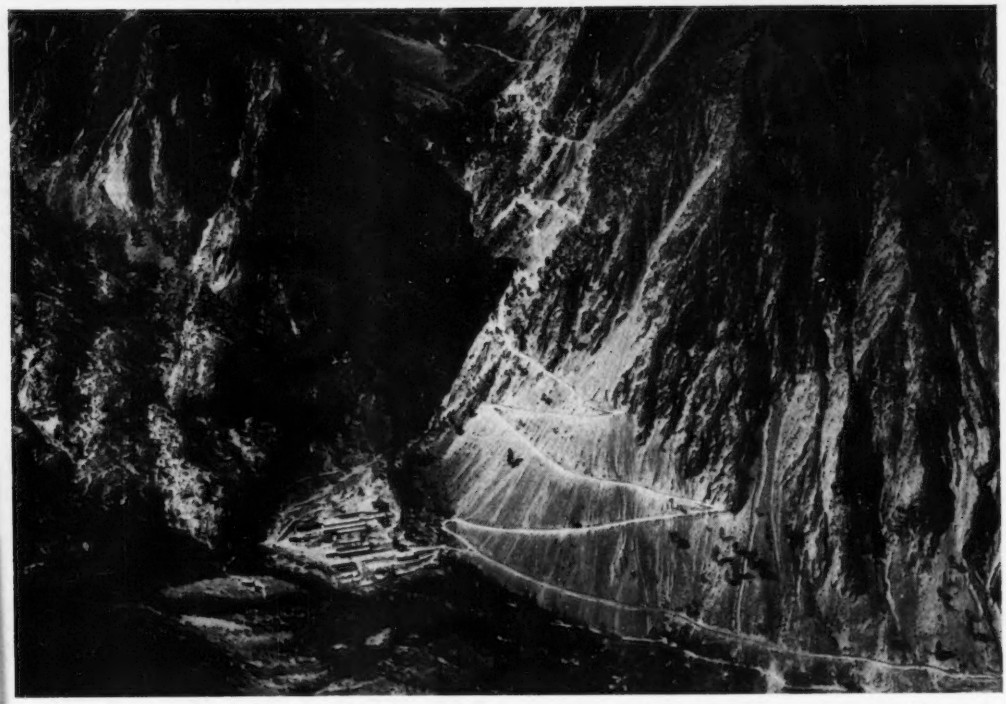
gradually CMP and allocations will have to be broadened.

Foreign Area Unresolved

The problems of exports, imports, and foreign production remain unresolved. Claimant functions are still divided between the Office of International Trade and Economic Cooperation Administration. The exploration subsidy does not apply to foreign projects and the provisions of the Defense Production Act for RFC and guaranteed private loans do not extend to foreign operations. The powers of General Services Administration to make procurement contracts, of Export-Import Bank to make loans, and of ECA to make purchases and advances against production remain as before. DMA is also negotiating with foreign producers for purposes of certifying procurement contracts. By mid-April the office of Economic Stabilizer Eric Johnston, preoccupied with the walkout of organized labor from the mobilization program, had taken no action to resolve the international price and supply tangle.

International Allocation

Nevertheless, the foreign aspects of our defense production problem are important and demand serious consideration. Foreign countries producing raw materials we need are not going to continue denying themselves the chance to obtain higher prices abroad, particularly if we refuse to export them a fair share of the manufactures they need. Foreign countries undertaking to participate in the defense of the West are very much irritated over what they consider our hoggishness in bidding for raw materials. Some competent observers believe that key countries of Western Europe are on the verge of runaway inflation, a development that would profoundly handicap the program of mutual defense. Also, some officials believe that domestic price control of commodities for which we are heavily dependent on imports, like copper, lead, zinc, tungsten, and cobalt, cannot work without drying up imports unless international price control or allocations can be set up. The only instruments which seem available are the international commodity conferences which have been organized and are now proceeding. However, it is unrealistic to hope for much from a scheme which demands unanimous concurrence under present conditions of a number of nations, producers and consumers. The tin conference broke up in general disagreement almost at the outset. Producers and consumers could not agree on price, and there was great resentment by producers at the action of the U. S. Government in breaking the price by suddenly stepping out of the market.



LARGEST U. S. PRODUCER of tungsten, United States Vanadium Co.'s Pine Creek mine, Bishop, Calif., is expanding production to meet defense demands. Mill appears above, road leads up to Zero Tunnel, at 9,300 ft. elevation.

How U.S.V.'s Pine Creek Mine

H. L. McKINLEY,
General Superintendent

T. W. HOLMES,
Mine Superintendent

L. E. SAUSA,
Mill Superintendent

United States Vanadium Co., a Division of Union Carbide & Carbon Corporation, Bishop, Calif.

ONLY A YEAR OR SO AGO the market for tungsten ore had almost completely evaporated. Now, the metal is more eagerly sought for than gold.

With foreign sources, in the Far East at least, probably cut off from us for some time to come, and with tungsten playing so important a role in the defense effort, it is natural to wonder what is being done to increase production in U. S. tungsten mines. The foreign sources normally represent approximately 75% of available world supply. This article details the current production efforts at the Pine Creek mine of United States Vanadium Co. near Bishop, Calif., a mine that alone accounts for approximately 40% of domestic production of tungsten.

Briefly, this is what the Pine Creek staff is doing to step up output of tungsten ores:

1. Rushing development work from low-level tunnel (Zero Tunnel) to increase mine output.

2. Driving 1,500-ft. raise and ore pass to connect low-level tunnel with older workings higher on the mountain.

3. Continue mining upper workings meanwhile, despite difficulty of getting ore down mountain on surface.

4. Expanding capacity of mill in order to process at least 1,000 tons of ore daily. Expanding chemical plant capacity.

5. Establishing ore-buying ser-

(Continued on page 78)

What It Takes to Operate

ZERO TUNNEL

DRIVING THE ZERO TUNNEL. Four-machine drill jumbo with DA. 35 drifters; Eimco 21 Rocker-shovel; 3-ton Granby-type mine cars on 18-in. gage track with 40-lb. rails. Storage battery locomotive.

ENLARGING THE ZERO TUNNEL. 1. From portal to about 3,000-ft. point. Ring drill rib with three DA 35 drifters on jumbo (illustrated); 1¼-in. round alloy steel with L-R 13-C-4 bits and I-R Carset bits.

2. From 3,000-ft. point to 7,000-ft. point. CP 5 diamond drills with EX, BW, EX plug, and EX straight-wall bits. Ditch holes drilled with DA 35 drills mounted on tripod on battery locomotive. Top diamond drill hole detonated with Rockmaster No. A cap and Primacord; bottom diamond drill hole with Rockmaster B cap. Top row of ditch with No. 1 delay; bottom row with No. 2 delay.

3. Original track replaced with 60-lb. rails laid to 36-in. gage.

EQUIPMENT IN ZERO TUNNEL: Two large chambers excavated in tunnel, one at 3,000-ft. point, and another at 7,000 ft. Chamber at 3,000 ft. houses car, drill, and general

ORE COMES DOWN mountain via tramway from Zero Tunnel to mill and chemical plant. Development on tunnel level, improved mining methods, expanded plant capacity plus custom milling are rapidly increasing production.

Will Increase Tungsten Output

a Tungsten Mine: Equipment and Supplies Used at Pine Creek Operations

repair shops. Chamber at 7,000 ft. houses a 3,000 cfm. I-R compressor driven by 500-hp., 4160-v. motor; a new 2,000-cfm. C-P compressor; transformer equipment and control panels; two Worthington Triplex pumps for drills; and sharpener for tungsten carbide bits.

HAULAGE EQUIPMENT: A 13-ton GE trolley locomotive. Ten-car trains consist of 10-ton Differential Steel Car Co. cars. Two motor-generator sets, one inside portal and one in compressor room supply 250-v. d.c. for locomotives. Block signal system, electric eye, and sirens control safe haulage. Main haulage cars are dumped by rotary dumper near Zero portal. Auxiliary haulage is by Mancha mules, and 8-ton and 4-ton trolley locomotives.

VENTILATION: Two 7,000-cfm. exhaust fans hooked in series at 3,000 ft. and 6,800 ft. from Zero portal. Steel vent lines are 24-in. in dia. Bad air is exhausted through a raise 500 ft. from the Zero portal.

SURFACE PLANT

SURFACE PLANT AT ZERO PORTAL: Office building, containing engineering office, first-aid room, lamp room, wash and dry room, time office, shifters office, timber framing shed, electrical supply warehouse, oil storage.

PRIMARY CRUSHING PLANT AT ZERO PORTAL: Cars dumped with Differential Steel Car Co. rotary tipple into 150-ton coarse ore bin. Ore goes to 4x16-ft. Sheridan grizzly powered by 50-hp. motor, which feeds 36x48-in. Traylor Type HB jaw crusher driven by 150-hp. motor. Plus 3-in. crusher product fed to 1,000-ton storage bin at head of aerial tram loading station by a 30-in. 185-ft. conveyor belt. Tram buckets loaded by 30-in. Link-Belt heavy-duty apron feeder driven by 15-hp. 56-rpm. gear motors.

AERIAL TRAM: Operates between primary and secondary crusher plants; is 4,153 ft. long; supported by five wooden towers. Twenty six 20-cu. ft. buckets ride system. Diameter of lock-coil cable on the load side is 1⅝ in., on return side is 1⅛ in. Cable speed, 500 fpm.; capacity, 106 tons per hr. Tram operates by gravity, braking by electrical generators.

MINING EQUIPMENT

STOPING: Ring drilling with C-P 55 diamond drills using 1 13/32-in. LM concave bits. Coring bits used for prospect drilling. Ring holes loaded with 60% Atlas and Hercules powder.

SCRAM DRIFTS: Scraping equipment consists of 50-hp. I-R and Sullivan slushers; 48-in. and 60-in. Pacific quarter-box scrapers and Eimco folding scrapers. Some scram drifts are fitted with steel sets.

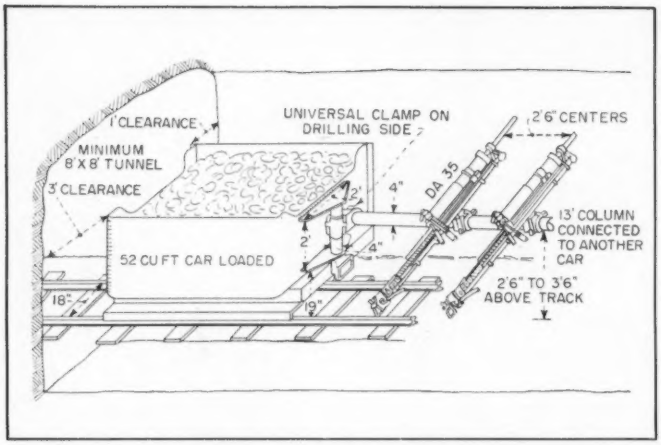
SUB-LEVELS AND LATERALS: Mucking is done with I-R and Sullivan 25-hp., 20-hp., and 15-hp. slushers with 42-in., 36-in., and 30-in. scrapers.

MAIN HEADINGS ON ZERO LEVEL: Mucked with Eimco 40 and 21 rocker shovels. Drilling done with DA 35 and DA 30 drifters and 3-jib Sullivan hydraulic drill jumbo. Broken waste loaded into 3-ton Granby-type cars dumped at portal with tugger hoist. Drill steel made of Park-A Crucible 1¼-in., round, hollow, alloy steel with tungsten carbide insert bits. Inserts are Haystellite Grade 17 Size A, B, and B1.

RAISING: Drills and I-R R-48 and R-58 stopers. Steel made up from 1-in. Park A hexagonal steel with tungsten-carbide bits made locally.

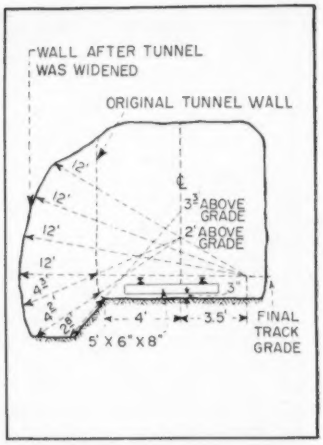
BLASTING: Drifts, crosscuts, and raises with 60% Atlas and Hercules powder detonated by fuse and electric caps.

The Jumbo That Enlarged the Tunnel, and . . .



ZERO TUNNEL was enlarged to provide larger drainage area at side. Jumbo employed consisted of a 13-ft. bar mounted between two loaded cars.

The Round



HOLES for ring drilling with drifters were positioned as shown above.

vice, now taking about 400 tons daily, with facilities for recovering increased tonnage.

6. Taking steps to reopen U.S.V.'s Riley mine near Golconda, Nev.

As the accompanying chronolgy shows, the Pine Creek ore at one time came only from open pits near the top of the Sierra and from underground workings reached through A Level. This is the original tunnel driven into the orebody at 10,800 ft. elevation. (Note that the tramway station shown on the cover of this issue is at the Zero Tunnel level at 9,300 ft.)

The tramway once extended up to A Level, but on Feb. 6, 1949, fire broke out in the A Level surface plant. Heavy snow blocked attempts to get fire-fighting equipment up the mountain. The best the staff could do was to smash the shed leading to the tunnel with a bulldozer to prevent the fire from spreading. The A Level loading terminal and some attached buildings were consumed.

Despite the lack of any market interest in tungsten ore at that time, the company went ahead with development on the Zero Tunnel level. No more mining was done on A Level. Broken ore on A Level was trucked down to the crusher station, when it was finished, at the Zero Tunnel portal.

Ore will still be brought down in this way by truck from A Level, and from the open pits up at 11,800 ft., until the raise and ore pass have been completed from the Zero Tunnel up to the A Level workings.

Development is proceeding with all possible speed on the Zero Tunnel level. The mining method used is outlined in the accompanying sketch, The entire mining operation, from the point of the drill bit on back to the primary crusher, is constantly being studied to work out a more efficient and productive technique. Mining, loading, and haulage equipment used is outlined in an accompanying table. It is worth noting that all mining is done on an incentive basis, except loading, which will be placed on incentive as soon as enough cars, now on order, are available to give the crews a fair chance to step up production.

The Orebody

The Pine Creek tungsten deposit of the contact metamorphic type, with scheelite-bearing tactite lying between granite and limestone. The orebody strikes north-south, with granite to the west and limestone to the east. The contact zone consists of garnet-diopside tactite, quartz, and quartz-feldspar rocks.

The tungsten orebodies, though irregular in size and metal content, are sufficiently large and persistent to be mined individually. They have fairly sharp limits and are not bordered by large tonnages of marginal-grade ore. Scheelite is the major tungsten mineral, but considerable tungsten occurs as powellite [$Ca(MoW)O_4$]. Molybdenite is also present. Chalcopyrite and bornite containing gold and silver are the copper minerals.

The Zero Tunnel

Originally this tunnel was advanced 8x8 ft. in cross-section. The first 3,000 ft. was driven without cherry-picker stations, and the last 4,000 ft. with cherry picker stations at 200-ft. intervals. Chief difficulty encountered in driving this tunnel was the heavy flow of water. At one time the flow was as high as 5,200 gpm. which covered the track in the entire tunnel with 9 and 12 in. of water. Need for a larger drainage ditch was obvious. Consequently it was decided to widen the tunnel to 12 ft., and provide an adequate drainage ditch running along next to the haulage way.

Two unique methods were used to enlarge the tunnel. The section of the tunnel from the portal and beyond the 3,000-ft. point was widened by drilling rings, each containing 7 holes, and spaced 2½ ft. in the tunnel rib. See illustration. A novel drill jumbo was made by welding a short piece of 4-in. drill column stock vertically to the ends of two 3-ton cars. A 13-ft. horizontal drill column was then suspended from these vertical columns by means of universal clamps as shown. When in operation, the cars were filled with rock to increase stability of the set-up. The horizontal column was mounted 3 ft. above the track. The machine crew consisted of four men, three drilling, and one changing bits.

In addition to setting-up and tearing down the jumbo, each drill

Mileposts For The Pine Creek Mine

Prior To 1916.—Property discovered by M. B. Sherwin, mineral surveyor. Located as silver-lead property, but location allowed to lapse.

1916.—Sproule and Vaughan, prospectors, relocate claim. Samples ran 1½% WO_3 as scheelite. Cooper Shapley, Round Valley assayer, aroused interest in property.

1918.—Mining begun by Pine Creek Tungsten Co.; dropped in 1919, owing to slump in tungsten market.

1924.—Tungsten Products Co. reopened mine, built 125-ton mill to produce scheelite and copper concentrates.

1925.—Mine produced 24,983 tons of ore averaging 0.53% WO_3. In 1926, 16,400 tons mined averaging 0.60% WO_3. Average recovery, 64%; ratio of concentration, 170 to 1; daily output averaged 1,500 lb. concentrate running 70% WO_3. Property closed in 1926, remaining idle 11 years.

1936.—U. S. Vanadium Co. acquired property. Bulk of ore mined in next few years came from adit at 10,800 ft. elevation called "A" Level.

1941.—Manpower shortages of World War II caused shift to diamond-drill blast-hole mining methods, which rapidly outran development work. Diamond drilling below "A" Level proved lower extension of orebody.

1943.—Zero Tunnel (actually "O" Level) begun 1,500 ft. below old workings to open orebody at lower levels.

1947.—Zero Tunnel stopped 7,000 ft. in from portal when short crosscut struck ore directly below largest stopes on "A" Level. Compressor station and shop rooms cut in the tunnel wall at this point.

1949.—Fire, Feb. 6, destroyed surface plant at "A" Level portal. Fire-fighting hampered by deep snow, which also prevented effective ore haulage down from "A" Level. Mining completely halted at this level, but development continued in Zero Tunnel, which became chief entry to mine.

1951.—Mine development permits approach to capacity in mill and chemical plant. Zero Tunnel widened and equipped. Ore sampling and buying program under way. For future plans, see text.

averaged 7 complete rings per shift, or 210 ft. of drilling per machine shift. Loaded ring holes were blasted in groups of 12 to 14 rings (about 30 ft. of tunnel) at a time with electric delays. When used in grandiorite, the standard 13-C-4 bits averaged 6 ft. before resharpening, but in silicified lime encountered in a 500-ft. section of the tunnel the footage per bit dropped to 0.47 ft. A switch to I-R Carset bits brought this figure up to an average of 45.7 ft., and bit cost obtained per ft. of hole drilled was $0.224.

The tunnel section from the 3,000 to the 7,000-ft. point containing cherry picker stations at 200-ft. intervals was widened by drilling two diamond-drill holes from the stations in both directions. Holes were parallel to the tunnel and 12 ft. in from the rib. The lower hole was 1 ft. above the track elevation, and the upper 5 ft. For ditching, two holes were drilled under the lower diamond drill hole and normal to the tunnel. These holes were collared at the base of the rib, and looked down at 15 and 45 deg., respectively. DA 35 drifters mounted on tripods on a battery locomotive were used. Holes were spaced at 2½-ft. intervals, and 4 to 5 ft. deep. Footage drilled by diamond drilling totaled 3,492; feet drilled per shift, 44.2; footage per bit, 51.4; and bit cost per foot, $0.28. These figures take into consideration various types of rock drilled, and time required for setting up and moving the drill.

Long-Hole Stoping Method

Current mining operations are carried on a short distance from the compressor room in the zero tunnel where a development drift has been driven northerly in the ore. General details of the sublevel, long-hole diamond drilling stoping method are shown in the accompanying illustration and explanation for a typical 300-ft. vertical block of ore. Some blocks were planned for ring drilling with diamond drills, and others for long-hole drilling with drifters and jointed steel, and tungsten carbide bits. However, long-hole drilling with drifters has not proved successful in ring drilling, though experimental work continues. Long-hole drifter drilling was occasionally used in flat-back shrinkage stopes where holes were drilled to a depth of 22 ft. and is now standard practice in narrower ore.

As illustrated ring drilling starts at the two end slots and retreats to the central raise. Originally the burden between rings was 4 ft., and space between back of the holes was 6 ft. This was later changed to 5 ft. and 7 ft. respectively. Currently a system of off-set half rings with a 2½-ft. burden and 14-ft. spacing between back of holes is used with success. Some of the advantages offered by this system include better use of millisecond delay caps and improved fragmentation. Layout of two normal rings and four half offsets including angle and depth of holes drilled, loading depth, and delay cap numbers are also illustrated. Normally a set of four rings is blasted one at a time.

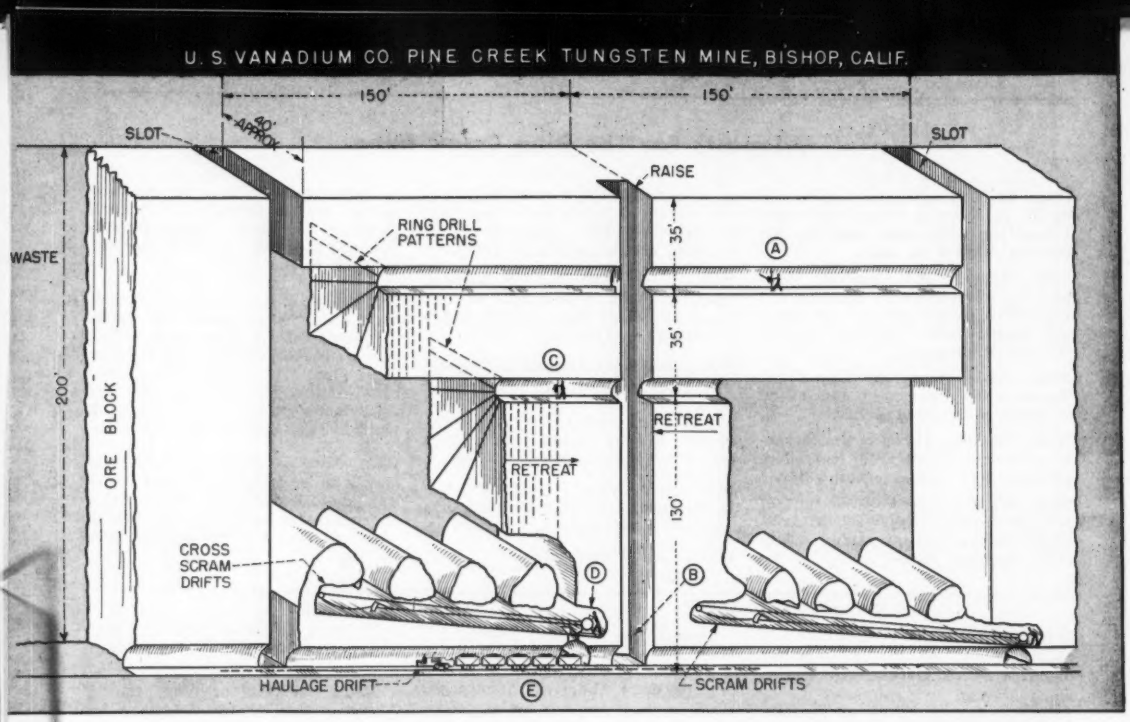
Since the start of ring drilling in June, 1950, tonnage broken up to November 1950 was 42,080; footage drilled, 22,828; feet drilled per manshift, 47.7; tons produced per man-shift, 87.8; pounds of powder to break a ton, 0.24.

The Pine Creek Mill

The problem at the Pine Creek concentrator is to get a clean separation, with good recovery, among these products: a copper concentrate, a molybdenum concentrate, a second molybdenum product, and a tungsten product. The first two are produced by flotation, and the last two, by chemical treatment.

The nature of the problem is made clear by a consideration of the ore and of the development of the present flowsheet. The ore minerals consists of: molybdenite, chalcopyrite, covellite, chalcocite, bornite, scheelite, and powellite. An 85% minus 65-mesh grind is necessary to release them.

In the 250-ton gravity mill that was set up when the company took over the property in 1937, it was evident that the fine grinding needed to release the scheelite also slimed it so badly that gravity methods could do no better than about a 60% recovery. Note from Table I that 72% of the WO_3 is in the minus 325-mesh fraction, which makes up only 37% of the weight of the ground ore. Subsequent test work showed that flo-



ORE IS MINED by sub-level method. Long-hole diamond-drill blast holes are drilled from sub-levels in half-ring pattern. (See below.) Letters indicate major operations shown in photographs. Cars are loaded with slushers.

How a Block of Ore Is Developed and Mined

Steps in current mining of a block of ore near the compressor room of the Zero tunnel are as follows:

1. First a drift is driven in ore in a northerly direction off Zero tunnel.

2. Crosscut is driven near the southern limit of the ore zone.

3. Development of a large block of ore for diamond-drill blasthole mining is started by advancing two scram drifts on the strike of the ore. (See idealized sketch of stope development).

4. Then four additional scram drifts normal to the strike of the ore are driven.

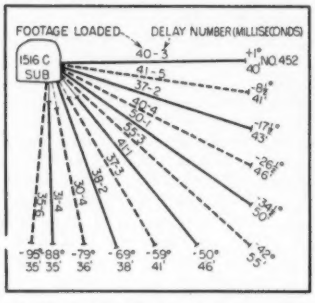
5. Three raises are driven on 150-ft. centers.

6. The two end raises are stripped of timber and prepared for conversion into slots.

7. Sub levels are established at 70-ft. and 35-ft. centers.

8. Ring drilling with diamond drills are started at two end raises converted into slots. Retreat is toward the central man and supply raise.

9. Blasted ore is removed from scram drifts with scrapers and loaded into mine cars on haulage level immediately below.



DOTTED LINES show half-ring drilled 2½ ft. behind other half-ring (solid)

tation could increase scheelite recovery to about 90%, but could produce a concentrate no higher in grade than 15% WO_3. Calcite and fluorite floated right along with the scheelite.

However, a flotation process was worked out for recovering a copper and a molybdenum concentrate and a low grade scheelite concentrate. This scheelite product was then tabled to produce a marketable tungsten concentrate carrying 60 to 73% WO_3. But the staff still had to deal with the table tailing, which ran about 5% WO_3 and carried nearly 30% of the tungsten in the flotation concentrate. This product was stockpiled, pending development of a chemical process.

Also, the high grade table concentrate always carried 2.5 to 3.0% molybdenum. Only a chemical treatment can remove this element, but for certain alloys, the molybdenum content is not objectionable. Therefore, most of the tungsten flotation concentrate goes to the chemical plant for purification, but some of the table concentrate is shipped for use in making tungsten-molybdenum alloys.

The present 1,000-ton mill and chemical plant was built in 1942. The process includes: secondary crushing of the ore at the foot of the aerial tram; fine grinding in

A LIMITS OF OREBODY are checked with diamond core drills. Don Markl runs drill; L. Wright checks core.

B RING DRILLING in sub-levels at point shown in sketch at left. Kurt Goyn and Cliff Stone drill adjacent rings.

C JOHN EMERSON, chief engineer, starts up the stope in a service skip in manway located in center of the ore block.

D SCRAPERS, powered by 50-hp. electric motor, transfers broken ore from bottom of stope to cars on haulage level. George Grieve operates IR slusher installation.

E WILMER WITT, shift foreman, John Emerson, chief engineer, and George James, motorman, wait green light.

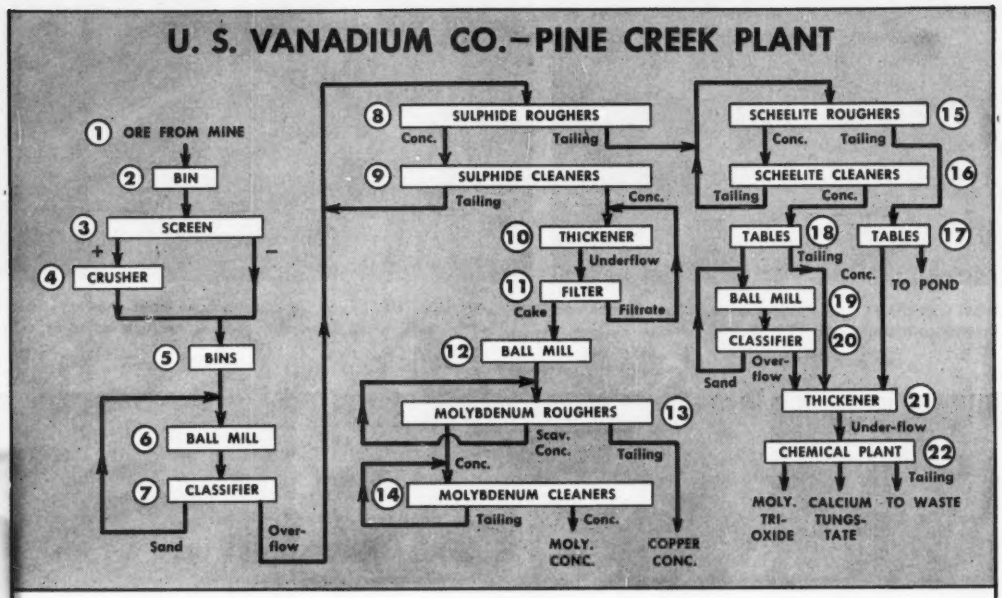
a single stage; bulk sulphide flotation; separation of copper and molybdenum by flotation; flotation of scheelite with some powellite; chemical separation and purification of the tungsten and molybdenum. The process units are arranged as shown in the flowsheet.

The sulphide product is floated with soda ash, pine oil, Aerofloat 301, sodium silicate, and Aerofloat 601. This concentrate is heated and filtered to remove these reagents and the molybdenum is then floated away from the copper using standard reagents. The scheelite is floated wth soda ash, sodium silicate, and other usual reagents.

Rougher tailings go over four No. 6 Deister Diagonal-Deck tables to show, and to recover any coarse scheelite. The final scheelite flotation concentrate is also tabled to remove coarse scheelite, which is reground in a separate circuit, or shipped directly for production of alloys in which presence of molybdenum is permissible.

The Chemical Plant

The objectives in the chemical plant are to separate the tungsten from the molybdenum in the flotation concentrate, and to recover both these elements in high grade



LEGEND

1. Minus 4-in. ore from mine primary crushing plant via aerial tram.
2. Wooden bin, 300-ton.
3. Symons vibrating screen, 32-in., rod-deck, ½-in. spacing.
4. Symons short-head cone, 5½-ft.
5. Four 1,000-ton circular steel bins, or to stockpile. Capacity of fine crushing plant is 800 tons per shift.
6. Four 6x5-ft. Marcy low-discharge ball mills, 25 rpm., 7½ tons 4-in. balls. Each mill grinds 250 tons per day to 86% minus 325 mesh. Ball consumption, 1 lb. per ton. Discharge, 70% solids.
7. Four Akins classifiers, 54-in., overflow at 55% solids.
8. Four identical rougher sections in parallel. Each has ten 32x32-in. M.S. cells; eight for flotation and last two cells for conditioning scheelite flotation feed.
9. Four cleaner sections, in parallel; five 32x32-in. M.S. machines in each. Two-stage cleaning; three cells in first, two cells in second. Sulphide concentrate has 20% MoS_2, 20% Cu, 30 oz. silver.
10. Thickener, 30-ft. diam., pulp heated to 60 deg. C., underflow diluted to 10% solids for filtration. Batch operation.
11. American filter, 3-disk.
12. Ball mill, 36-in., filter cake ground at 70% solids.
13. Pulp at 20% solids to two banks, six cells each, 24 x 24-in. M.S. machines. First bank produces primary concentrate; second bank, scavenger concentrate.
14. Eight stages of cleaning in 16 24x24-in. M.S. cells, two cells to a stage. Tailings from each stage return to previous stage; tailing of first stage returns to first bank in molybdenum roughers.
15. Four scheelite roughers in parallel; each has ten 32x32-in. M.S. cells. Each section "hog-troughed" by holes through cell partitions to form groups of 4-2-2-2 cells in each of the four sections.
16. Two-stage cleaning; five 32x32-in. M.S. cells in first, two 32x32-in. cells in second.
17. Four No. 6 Deister Diagonal-Deck tables recovering coarse scheelite from rougher tailings.
18. One No. 6 Deister Diagonal-Deck table recovering coarse scheelite from flotation concentrate.
19. Ball mill, 36-in.
20. Spiral classifier, 12-in.
21. Thickener, 30-ft., handles feed to chemical plant.
22. Chemical plant makes high-grade molybdenum and tungsten products. (See text).

MEET THE AUTHORS

H. L. McKINLEY,
General Superintendent

T. W. HOLMES,
Mine Superintendent

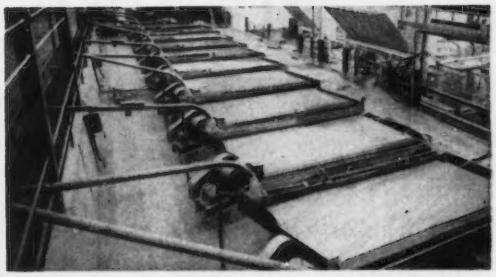
L. E. SAUSA,
Mill Superintendent

U. S. Vanadium Co., a Div. of Union Carbide & Carbon Corp., Bishop, Calif.

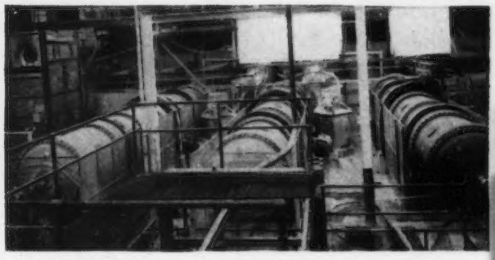
marketable products. Briefly, this is done by: 1, converting the tungsten and molybdenum into soluble tungstate and molybdate by pressure digestion with a suitable chemical; 2, precipitating molybdenum sulphide and filtering it off; 3, precipitating tungsten as calcium tungstate. Recovery of tungsten and molybdenum is 98% and 95%, respectively. The molybdenum sulphide is roasted to molybdenum trioxide before shipment, and the calcium tungstate is nodulized.

The company has completed a separate crushing, conveying and

FLOTATION SECTION at Pine Creek uses M. S. machines, makes copper, molybdenum, and scheelite concentrates.



TABLES have job of separating coarse scheelite for regrind, also making high-grade concentrate for shipment.



CHEMICAL PLANT makes pure tungsten and molybdenum products from concentrates. These are pressure digesters.

sampling plant at the Pine Creek mill site so that crude ores may be purchased from outside producers. The plant can handle at least 1,000 tons in eight hours.

As this was being written, ten producers were selling ore to the company, and over 100 samples from other small properties were going through research to determine suitable methods of treatment. During March 5,190 tons of ore was purchased, and it was expected that ore would be coming in at a rate of 400 tons per day by the time this article appears.

To be accepted, ores must have scheelite and powellite as the tungsten minerals, and must have a minimum WO_3 content of 0.4%. There is no definite upper limit on tungsten content of ores that will be accepted for flotation. Maximum grade of available milling ores is about 3.5% WO_3. A higher tungsten content than 6% WO_3 makes an ore more amenable to treatment in the chemical plant than in the mill. The company will buy concentrates, and has already purchased table middlings, magnetic separator rejects, and other products, some of them from as far away as Idaho. Samples of all ores and concentrates must be submitted in advance to see how they will behave in the plant.

Table I—Screen Analysis of Classifier Overflow

Mesh	% Weight	Cum.% Weight	Assay %WO_3	Assay %Mo	Assay %Cu	% Distribution WO_3	% Distribution Mo	% Distribution Cu
+48	6.4	6.4	0.078	0.29	0.14	1.0	5.9	3.3
+65	8.0	14.4	0.074	0.27	0.16	1.2	6.8	4.7
+100	11.1	25.5	0.104	0.24	0.16	2.3	8.4	6.5
+150	11.9	37.4	0.150	0.25	0.18	3.5	9.4	7.9
+200	13.7	51.1	0.296	0.28	0.22	8.0	12.1	11.0
+325	12.2	63.3	0.504	0.25	0.25	12.1	10.0	11.3
−325	36.7	100.	1.00	0.41	0.41	71.9	47.4	55.3
Total	100		0.510	0.32	0.27	100	100	100

Housing Important

Lack of enough housing has been one of the principal limiting factors on production. More miners are needed. Steps are being taken to provide additional housing facilities for such miners.

There are two company-maintained housing projects; the Scheelite Village is near the mill, and the Rovana Village is located at the mouth of Pine Creek at an elevation of about 5,000 ft. These completely modern villages consist of two and three bedroom houses. Transportation from the Villages to mine and mill is made available by the company to employees who elect to use such buses. The Inyo County Housing Authority also maintains a 52-apartment housing project in Pine Creek available to the company's employees. School facilities through the eighth grade are provided at Rovana, and a daily bus takes older children to the high school at Bishop.

By providing an opportunity for miners to increase their earnings through increased productivity, by achieving an improved community life, and by constantly working toward a more efficient and productive mining and milling process, the Pine Creek staff confidently expects to make its best contribution to this country's defense effort.

PHOTOGRAPHS:—
Curtis Phillips, Phillips Camera House, Bishop, Calif. Pp. 76, 81-A-C-D, 83.
Larry Sharkey, *Los Angeles Times*, Los Angeles, Calif. Pp. 77, 81-B-E.

How Granby Increased Mill

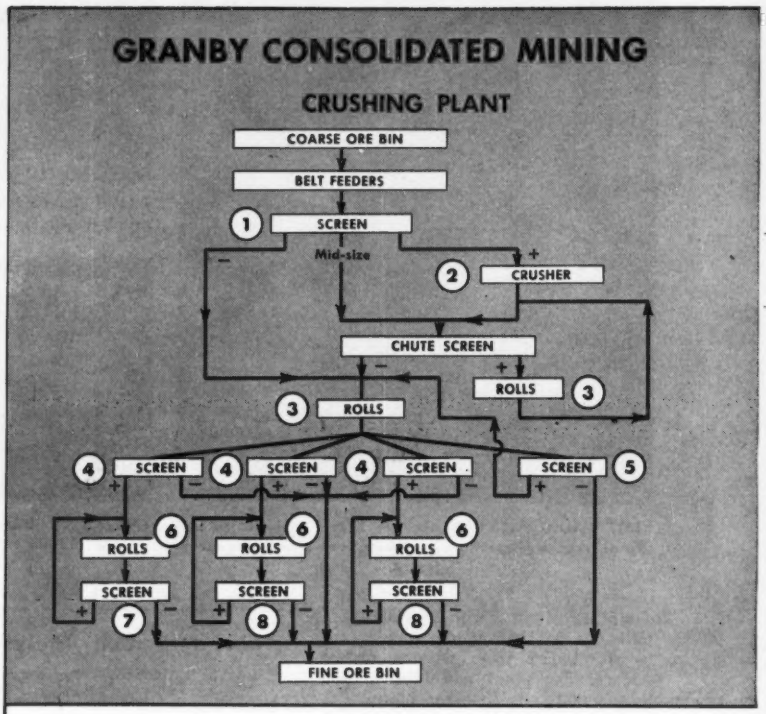
Granby's highly efficient mining methods were described in E&MJ, January, 1951. This article tells how mill capacity was increased to match greater ore production from the mine.

JOHN HUTTL, Associate Editor

THE PRIMARY CRUSHING PLANT for the Copper Mountain property is near the No. 6 tunnel portal in Similkameen Canyon. This is the southern terminal of the Kettle Valley branch line over which the crushed ore is transported to the concentrator at Allenby. Ore is crushed in three stages—first to 6 in. in a 36x42-in. Farrel-Bacon and 36x48-in. A-C jaw crusher, and then to 1½ in. in a 7-ft. standard Symons cone crusher served by a Jeffrey vibrating feeder. Two 10-in. A-C Superior McCulley gyratory crushers are available as standby units. Final crushing to minus ¾ in. is done in a 5½-ft. Symons short-head cone crusher. Two 4x12-ft. Dillon vibrating screens remove the minus ¾-in. material ahead of this crusher; these screens have 2-in. openings on the top decks and ¾-in. openings on the lower decks. Screen undersize is belt-conveyed to loading bins over the railroad tracks. Here, a train of twenty 72-ton cars is loaded in 25 min.

The Allenby Concentrator

When milling was resumed at the Allenby concentrator in June, 1937, plant capacity was 3,000 tons a day. Since then, through changes made in the flowsheet and addition of units to the primary and secondary crushing plants, and in the grinding and flotation departments capacity has been increased to more than 5,300 tons. It is believed that by adding more screening equipment to the secondary crushing plant, this figure can be raised to 6,000 tons. Plans are now being made to determine the number and type of screens required and how these units can be fitted into an already crowded plant. Operations as conducted today at the secondary crushing plant and concentrator proper are shown in the accompanying simplified flowsheets.



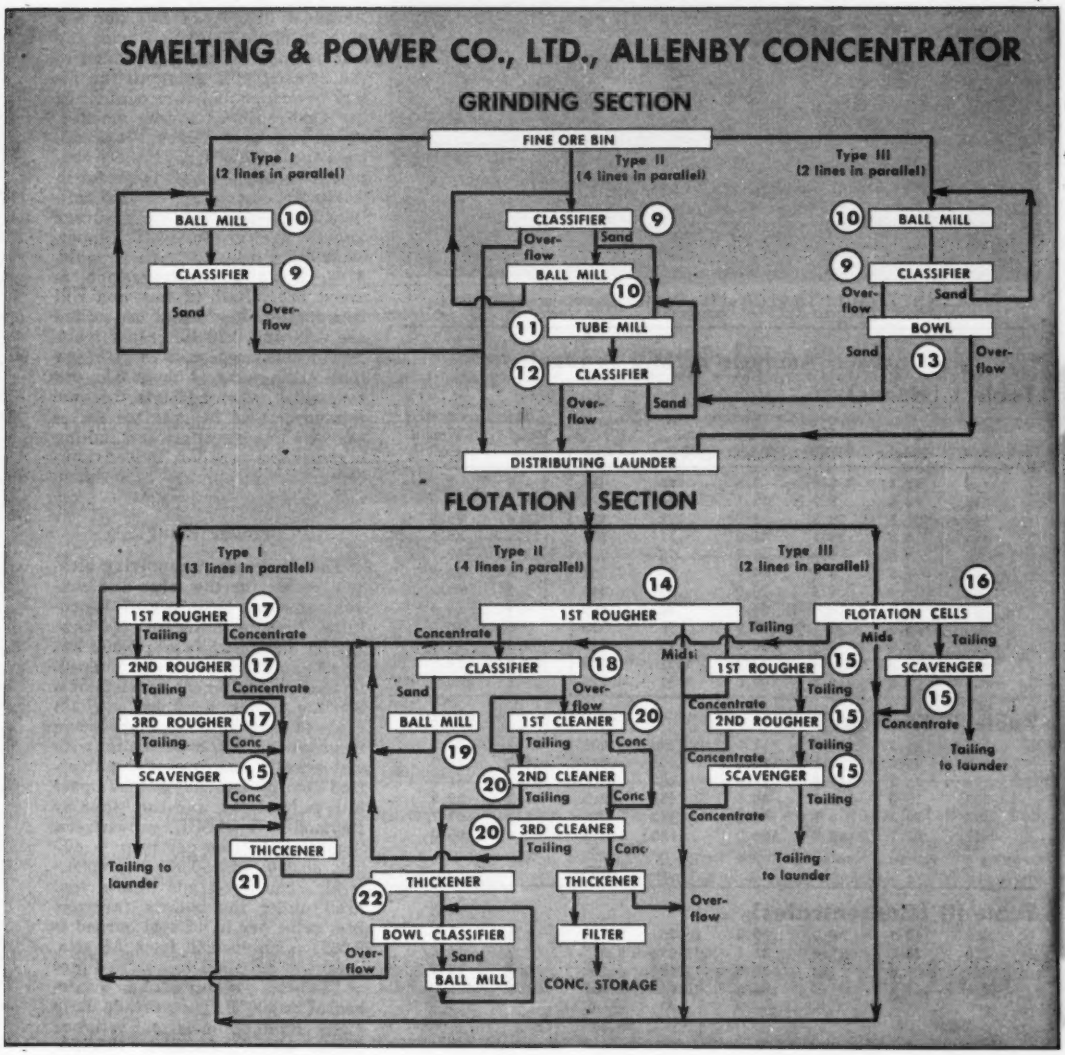
LEGEND

1. 4x6-ft. TyRock screen, double-deck.
2. 36-in. Gyrosphere crusher.
3. 72x20-in. Garfield rolls
4. Hummer screen.
5. Four Hummer screens in parallel.
6. 54x20-in. Traylor rolls.
7. Three Hummer screens.
8. Three Hummer screens and one impact.
9. 72-in. Akins classifier.
10. 7x10-ft. ball mill.
11. 5x20-ft. tube mill.
12. 8x30-ft D.S.D Dorr classifier.
13. Bowl classifier.
14. 4-cell Denver No. 30 Sub A flotation machine.
15. Air cell flotation unit.
16. 10-cell mechanical flotation unit.
17. 18-ft. air cell.
18. Two 6x28-ft. Dorr classifiers and one 20-ft. bowl in parallel.
19. 7x10-ft. ball mill.
20. 4-cell Denver machine.
21. Two 40-ft. thickeners in parallel.
22. One 20-ft. thickener.

Roll-plant feed is withdrawn from 2,500-ton storage by 11 belt feeders and reduced in size as shown in the flowsheet to produce a final ball-mill feed of minus 0.087-in. in size. A screen analysis of the feed is given in Table I.

Grinding to about 60% minus-200 mesh is accomplished in one stage by eight 7x10-ft. ball mills and six 5x20-ft. tube mills. Classification for the ball mills is accomplished on 72-in. Simplex double pitch high weir-type Akins classifiers, while the tube mills are operated in closed circuit with 8-ft. x 28-ft. 4-in. and 8-ft. x 30-ft. model D. S. D. Dorr classifiers. Four ball mills receive feed direct from the 3,500-ton fine storage bin, while in the other four mills, the feed from the storage bins is directed to the classifiers. Overflow from two classifiers goes to a large bowl classifier

Capacity by More Than 78%



and that from all remaining classifiers including the bowl classifier and all tube-mill classifiers goes to the distributing launder at the head of the flotation department at 30 to 32% solids.

Four ball mills operate in closed circuit (See Type I and Type III in flowsheet) whereas the classifier sands from the remaining mills are partly returned to the ball mills and partly split to feed the tube mills together with the sands from the bowl classifier. (See Type II in flowsheet of the grinding section.)

The rougher flotation section consists of a parallel arrangement of three banks of four 18-ft. air cell units (Type I), two 10-cell mechanical units of local design (Type III) and four 4-cell Denver No. 30 Sub A machines (Type II), each followed in series by three air cell units. Rougher concentrates are pumped direct to the classifiers of the regrind unit which consists of a 7x10-ft. ball mill operating in closed circuit with two 6x28-ft. Dorr classifiers and a 20-ft. bowl classifier before going to the cleaner circuit. The rougher middlings are pumped to two 40-ft. thickeners, the underflow from which is fed to the classifiers of the regrind unit.

The cleaner equipment consists of three 4-cell units, the first two units arranged to operate in series or in parallel but both to deliver their concentrates to the third or final cleaner unit. Tailings from the No. 1 and No. 2 cleaner units are pumped to 40-ft. and 20-ft. thicken-

ALLENBY CONCENTRATOR of the Granby Consolidated Company.

Screen Analysis of Mill Products

Table I (Heads)

Mesh	Gms. Weight	% Weight	Cumulative % Weight	% Cu.	Weight Cu.	% Weight Cu.	Cumulative % Weight Cu.
8	12.1	2.4	2.4	.65	.016	1.8	1.8
10	48.4	9.7	12.1	.74	.072	8.2	10.0
14	101.5	20.3	3.24	.72	.146	16.6	26.6
20	70.6	14.1	46.5	.77	.108	12.3	38.9
28	49.4	9.9	56.4	.78	.077	8.8	47.7
35	41.5	8.3	64.7	.75	.062	7.1	54.8
48	27.4	5.5	70.2	.83	.046	5.2	60.0
65	22.2	4.4	64.6	.88	.039	4.4	64.4
100	16.9	3.4	78.0	.95	.032	3.6	68.0
150	14.0	2.8	80.8	1.12	.031	3.5	71.5
200	12.2	2.4	83.2	1.21	.029	3.4	74.9
−200	83.8	16.8	100.0	1.31	.220	25.1	100.0(.900)

Table II (Tailings)

65	21.9	11.0	11.0	.350	.039	21.3	21.3
100	25.0	12.5	23.5	.263	.033	18.0	39.3
150	23.1	11.5	35.0	.187	.022	12.0	51.3
200	18.9	9.5	44.5	.157	.015	8.2	59.5
325	19.4	9.7	54.2	.150	.015	8.2	67.7
−325	91.7	45.8	100.0	.130	.059	32.2	100.0
Total					.183		(1.76)

Table III (Concentrates)

200	19.7	9.9	9.9	16.70	1.65	6.3	6.3
270	23.3	11.6	21.5	17.55	2.04	7.7	14.0
325	14.6	7.3	28.8	17.79	1.30	4.9	18.9
−325	142.4	71.2	100.0	30.05	21.40	81.1	100.0
Total					26.39		(26.477)

ers in parallel the underflow of which may feed to a second regrind mill or be sent without regrinding to the retreat-tailing unit which consists of 4 air cells in series. Froth from the retreat tailing unit is returned to the cleaner circuit but tailings are combined with the general tailings.

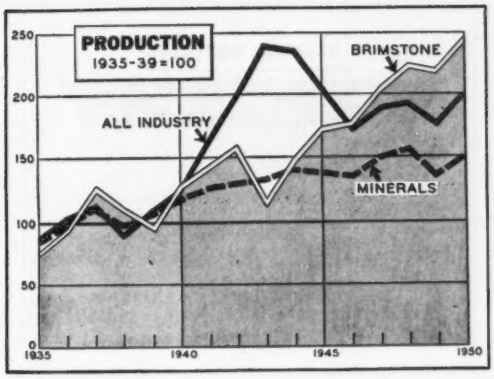
Tailings from third cleaner are pumped to the three classifiers of the regrind unit. Final concentrates go to a 40-ft. thickener overflowing to a second 40-ft. thickener, whence the overflow is pumped to the two thickeners treating rougher middlings, the overflow of which in turn is pumped to a mill water supply tank. The underflow of the concentrate thickeners goes to the filter plant containing two 6-disk American filters. Note: In the simplified flowsheet on page 85 there is only one string of cleaner cells headed by a ball mill and classifier.

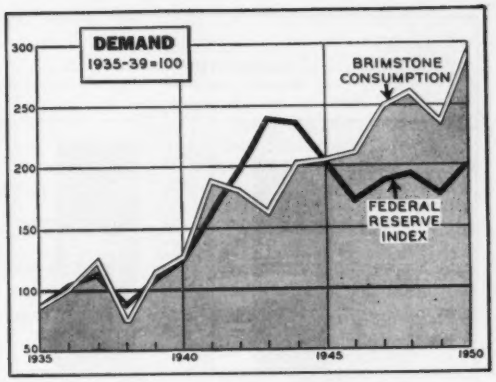
All reagents are added at the head of the rougher flotation circuit. Types and quantity used per ton of ore treated are pine oil, 0.045 lb.; Aerofloat 25, 0.046 lb.; Aerofloat 208, 0.018 lb.; and sodium sulphide, 0.018 lb. During the summer months alum is added to the concentrates going to the filters to reduce moisture content of the cake shipped to the smelter. Steam is used in winter. Final copper concentrates assay 26.39% copper. A screen analysis is shown in Table 3. Composition of final tailings is shown in Table 2. Recovery figures are as follows: Copper, 82.38%; silver, 80%; and gold, 87%. Ratio of concentration is about 33:1. Ball (2 in.) and roll consumption per ton of ore milled are 0.58 and 0.20 lb. respectively. Power consumption is 24 kwh. per ton. Milling cost is about 83c. per ton, which, when added to the total mining cost of 75c. per ton makes the combined milling and mining cost per ton very low indeed. Concentrates are shipped to Tacoma.

Power Plant

The steam plant supplying electric power for the mine and concentrator was built in 1937. It contains turbine units of 500 kw. (a.c.); 2,000 kw. (a.c.); 5,000 kw. (a.c.); and 10,000 kw. (a.c.) capacity. Boiler equipment consists of a Stirling boiler fired by a chain grate stoker; and two Combustion Engineering VU-type units with water walls, one fired with pulverized coal by two Raymond Impact Mill pulverizers, and the other by Raymond Bowl-Mill pulverizers. Steam production per hour is 40,000, 80,000, and 80,000 lb. repsectively. The low-grade lignite coal fired under the boilers (average btu. value per lb. of coal burned is 9,063) is shipped in from Alberta. Steam is supplied to the turbines at 250-lb. pressure and superheated to 600°F. The average daily plant production is as follows: Gross kwh. generated, 175,290; kwh. used by plant, 12,722; kwh. line losses, 9,263; net kwh. delivered, 153,305; tons of coal burned, 181.4; and lb. of steam evaporated, 2,290,977.

Thanks are expressed to A. S. Baillie, president of Granby Consolidated Mining, Smelting & Power Co., Ltd., for permission to publish this article, and the many courtesies extended by Walter I. Nelson, general manager, R. S. Douglas, mine superintendent, and L. H. McKay, mill superintendent, are gratefully acknowledged.

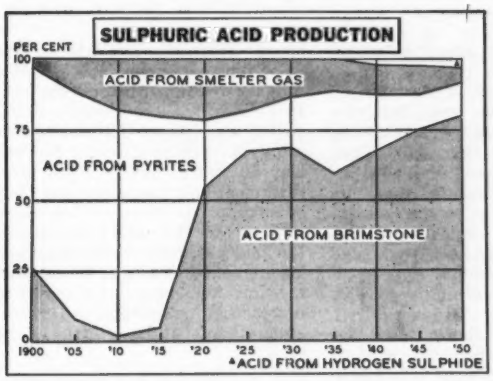


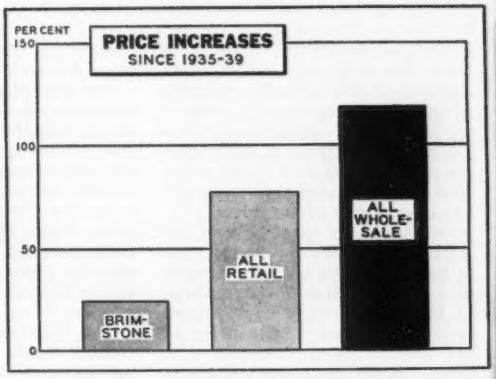


Despite Sharply Increasing Production Of Sulphur . . . Demand Is Outrunning Supply.

CHART I shows how sulphur (brimstone) production has passed both other mineral, and industrial, production.

CHART II shows how growth of sulphur consumption climbs, despite wide fluctuations in industrial activity.





Although Industrial Use Of Sulphur Is Away Up . . . The Price Of Sulphur Stays Relatively Low.

CHART III shows how deeply sulphur has cut into place of other materials as source of sulphuric acid.

CHART IV shows relatively small increase in price of sulphur compared to average wholesale and retail prices.

What's Behind The Sulphur Shortage?

LANGBOURNE M. WILLIAMS, JR.,
President, Freeport Sulphur Co.
New York, N. Y.

WE, WHOSE JOB IT IS to produce sulphur, must regard with mixed feelings the sudden, widespread, and anxious attention lately given our industry. On the one hand, we are gratified that the key position of sulphur in the world's economy is given due recognition. On the other hand, we are disturbed that current shortages may divert attention from the true facts of sulphur's past and future.

Sulphur has always been a humble servant, an inconspicuous and humdrum servant of all industry and agriculture. Until recently, it has attracted little attention, however, because ever since the first World War it has been in plentiful supply, it has been furnished in a product of high and constant quality, it has caused consumers no worries, and it has been an unseen and insignificant element in the cost of most of the products reaching the final consumer.

In fact, when sulphur has attracted attention, it has been mostly as a nuisance in smog or in stream pollution, or as an unwelcome impurity in production of oil and steel.

Demand Outruns Supply

Now, however, sulphur is in short supply all over the world and is causing national and international difficulties in an acute de-

From an address given before the New York Section, A.I.M.E.

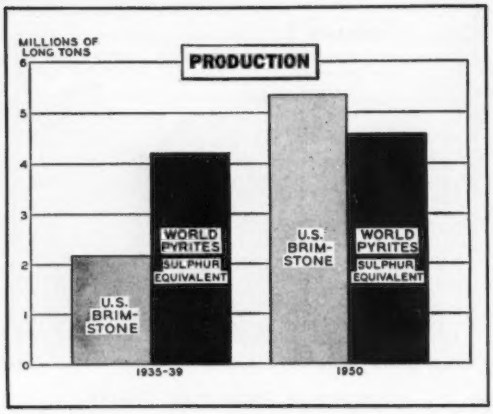


CHART V shows how low cost, high quality of U. S. sulphur are reflected in expanding use, on world-wide basis, as compared with pyrite, formerly the world's chief sulphur source. Problem now is to fill world's sulphur demands.

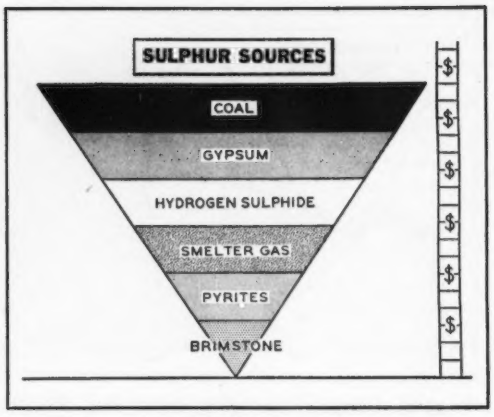


CHART VI shows potential future sulphur sources compared as to cost and approximate quantity available. Sulphur is cheapest and best; cost and quantity available increase upward. This shows rough relationship only.

gree. The reason for this is very clear. The sulphur situation is an example of the orthodox working of the mousetrap theory in which we Americans believe and take pride. We have made a better product and sold it at a lower price. The result has been that the world has beat a path to our door.

Sulphur is not short because the American sulphur industry has failed to keep up with the procession in production. We are ahead of the procession. This is shown clearly on Chart I. The index of the production of minerals as a whole shows that production in 1950 was 50% above the 1935-39 average. The general level of industrial production increased 100%. American brimstone increased almost 150%. During the same time, steel production went up 108% and petroleum production was up 68%.

But brimstone production, in spite of its great increase, could not keep up with consumption. Chart II shows that consumption of brimstone in the United States last year was almost 200% above the 1935-39 average, compared with a gain of 100% in general industrial activity as measured by the Federal Reserve Index.

Who Uses Sulphur?

Where did this sulphur go? Three-fourths of it was made into sulphuric acid. This acid, in turn, supplied many other industries. The industry consuming the largest amount was fertilizer production which took about 5,500,000 tons of acid.

The next largest amount, 2,600,000 tons of acid, went into the production of detergents, plastics, dyes and other chemicals. Then came petroleum refining with 1,500,000 tons, paints and pigments with 1,000,000 tons, rayon and cellulose film with 800,000 tons, iron and steel with 650,000 tons, and explosives and various other products with the remaining 500,000 tons.

One fourth of the sulphur was used in forms other than acid. A large part of this went to the pulp and paper industry. Other amounts were used in the manufacture of rubber, insecticides and fungicides, and various other products.

Who Produces Sulphur?

Our American brimstone is, of course, only one of the many forms in which sulphur is produced. Last year the four American Gulf Coast salt dome producers mined 5,200,000 tons of sulphur. Six American companies produced 150,000 tons of brimstone from sour gas and sour oil, and some 45 other companies produced the equivalent of 650,000 tons of sulphur from smelter gases, pyrites, etc. The total American production of element S was 6,000,000 tons. The total world production of element S was 11,700,000 tons.

As I have said, sulphur is used primarily for the manufacture of sulphuric acid. At the present time most of the acid produced in the United States is made from brimstone. This was not always the case, for acid can be made from a number of competing sources such as pyrites, smelter gases, refinery gases, etc. Chart III shows the story of acid production for the last 50 years. Early in the century most acid was made not from brimstone but from pyrites. Back in 1910 less than one twentieth of the acid was made from brimstone. Then about the time of World War I, brimstone's proportion began to increase quite sharply, and now it amounts to about four fifths of the total.

Brimstone Is Cheapest

Brimstone, as you see, has displaced other sources. One of the reasons for this, obviously, is price. Brimstone is the cheapest of the elements. Tin, for example, sells for $1.34 a pound; nickel for 50½c; copper for 24½c; aluminum for 19c; zinc for 17½c; lead for 17c. Sulphur, the lowly element, sells as American brimstone for less than 1c a pound. Chart IV shows the price story.

The displacement by brimstone of other sources is also illustrated by Chart V which shows the world output of sulphur from the various sources for the 1935-39 period and for the last year. Before the war, pyrites accounted for more than one half the world total, brimstone from the United States for slightly over one fourth, and other sources for the remainder. Last year, brimstone supplied nearly half the world total, and the other sources supplied correspondingly less.

Exports By Directive

In the latter part of 1950, accumulated domestic and foreign demand for U. S. brimstone began to exceed by an appreciable amount the available supply. In order to fill domestic needs first, exports to countries overseas were drastically curtailed. This curtailment created serious problems for some of the nations with which our Government is working closely in the present international emergency. Many of these countries made requests which led our Government to allocate a specified tonnage of sulphur for shipment abroad, and to direct the American producers to supply this tonnage. The quotas for shipments overseas in the first quarter of 1951 amounted to a total of 200,000 long tons, or about 75% of the corresponding average quarterly exports in 1950.

In the present emergency, although we would otherwise be in a position to meet the full requirements of our customers in this country, we have of course complied promptly with the request of our Government and have notified our domestic customers that beginning Jan. 1, 1951, we would allocate sulphur to them on the basis of 85% of their purchases for the year ended Sept. 30, 1950.

New Sources Sought

For many years the sulphur-producing companies have carried on prospecting and exploration programs, and these efforts are being vigorously prosecuted at the present time. The search is being conducted not only in the Gulf Coast region of the United States but also in Mexico and other parts of the world.

Freeport Sulphur Co. recently completed negotiations for the sulphur rights at four prospects in Louisiana and one in Texas. We are embarking at once on a program of exploratory drilling. Most of these domes are located in marshy areas where operations will be difficult and the hazards great. While we believe that these prospects represent important opportunities for exploration and possible development, we cannot determine their value as new sources of sulphur until extensive additional drilling has been done.

The prospecting and exploration efforts of the various companies have led to projects now under way to put into operation three new Gulf Coast mines. One of these projects is being undertaken by Texas Gulf Sulphur Co. at Spindletop dome in Texas, and the others by Jefferson Lake Sulphur Co. at Starks dome, and Freeport Sulphur Co. at Bay Ste. Elaine dome in Louisiana.

Hardships of Mining

The Bay Ste. Elaine project, for example, lies on a desolate stretch of broken coastline southwest of New Orleans. Two thirds of the surface areas of the dome is under the waters of a bay, and the remainder consists of "floating prairie," a mat of decayed grasses resting on a sea of ooze. It lies exposed to the full brunt of tropical gales, hurricanes, and storm tides.

Because of these unusual conditions, our engineers are designing an "amphibious" mining plant unlike anything ever before attempted. A power plant large enough to supply almost 2,000,000 gallons of superheated water a day will be mounted on a steel barge 40 ft. wide and two thirds of a city block long. It will be floated to the dome 75 miles away, and sunk in place. Shops, warehouses, and other auxiliary buildings will also be built on barges and floated in.

There are, in addition, many other engineering problems to be solved that were not faced in developing the older sulphur mines. Drilling operations will have to be conducted by floating rigs shifted from time to time along channels which we shall have to dredge. The unstable marshland will not support the sulphur once it has been mined, and it will have to be transported in molten form by barge for storage 75 miles away.

On top of this is the uncertainty over whether the sulphur can be succesfully mined at all. Although preliminary drilling has indicated the existence of a small deposit, we shall not know whether the sulphur can be mined until after we build the plant and put it in operation. While we are willing to assume these risks in the hope of developing an additional source of sulphur, we are informing our stockholders that we may not succeed in establishing profitable production at this property.

New Methods Tried

In addition to the salt dome activities, attempts are being made by the sulphur-producing companies, as well as by others, to obtain sulphur from other sources. Increasing attention is being given to processes for obtaining sulphur in some form from pyrites, sour natural gas, refinery gas, smelter gas, and even gypsum.

The potential supplies of sulphur that could some day be obtained from these various sources are vast. They may be likened to an inverted pyramid, as shown by Chart VI. This chart is an attempt to illustrate general relationships and not actual quantities and costs.

At the tip of the pyramid is brimstone, the best material from the standpoint of ease of use, purity and versatility, and also the cheapest. Next comes pyrites. In this country no brimstone is produced as such from pyrites, but processes for obtaining brimstone in this fashion have been in operation for a number of years, notably in Norway and in Spain. Pyrites is used, however, at some locations in this country as a source of sulphur for the production of sulphuric acid.

Next up the ladder of cost is sulphur from various gases, such as smelter gas and hydrogen sulphide from natural gas and from refinery operations. While considerable quantity of acid is produced from smelter gases, this operation is limited by the location of the gases and the fact that freight costs to markets are in most cases very high. There are, however, large quantities of such gases available, and increasing demand for sulphur materials will undoubtedly cause an expansion of this activity.

Finally at the top of the pyramid are enormous quantities of sulphur contained in gypsum and coal. These latter forms of sulphur are the most difficult and expensive to produce, and their utilization lies farthest in the future.

Increased Output Ahead

In a free economy, the law of supply and demand works to correct any temporary shortages that arise. However, the necessities of our national defense effort and its attendant economic controls may for the present prevent a sufficient increase in the price of sulphur to permit the restoration of the normal balance between demand and supply. In my opinion, however, the long range outlook is for higher prices to bring about the production of higher-cost sulphur from various sources in all parts of the world.

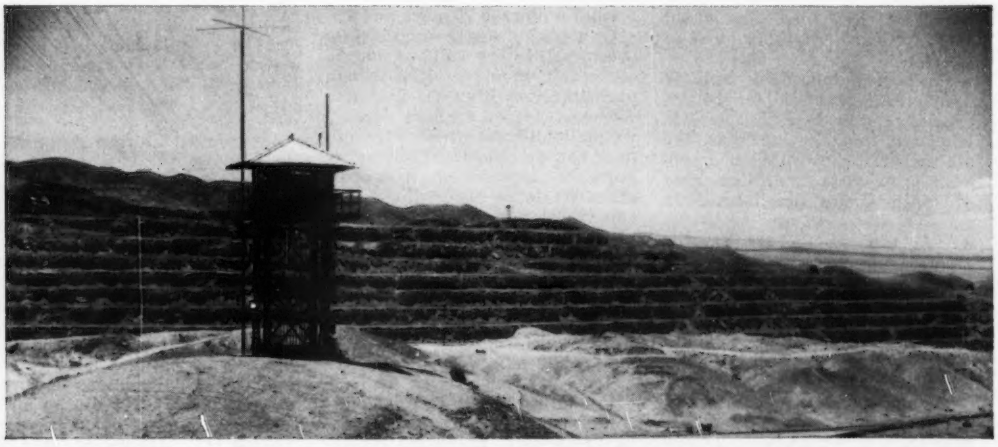
ORE-HAULING ELECTRIC LOCOMOTIVES at Chuquicamata can hold two-way talk with main radio control tower (see opposite), thanks to use of 152-mc. frequency at tower and 162 mc. on locomotives.

Two-Way Radio Speeds Open-Pit Work

Primarily for train dispatching, the system helps bench foremen meet sudden changes, talk with shovel men and maintenance crews.

HARRY L. BURR
Electrical Superintendent for Chilex
Chuquicamata, Chile

VERY HIGH - FREQUENCY RADIO communication adopted by Chile Exploration Co. for railway train dispatching in its open-pit mining operations at Chuquicamata, Chile, has given many unanticipated advantages, apart from expediting train movements. One advantage in particular is that bench foremen employ this means to report necessary changes to bench operations or any irregularities which occur affecting these operations. In the pit area, locomotives are generally



INSTRUCTIONS BY RADIO-TELEPHONE are received here at switch control tower No. 7 from main dispatcher's tower on skyline in center whereby the air-operated track switches in the area are controlled.

MAIN RADIO CONTROL TOWER, here seen close up, can communicate also with the mine trucks, such as the one at right, eliminating delay when service is wanted from maintenance crews.

more accessible than telephones; thus considerable time is saved in reporting these contingencies and putting into effect the changes required. Maintenance crews are also being contacted by this method and more quickly dispatched to other locations. As locomotives are generally operating near electric shovels, instructions can also be relayed to the crews on the latter.

As a means of communication for dispatching, the new system permits all electric locomotive operations to be controlled by one central train dispatcher, who has immediate contact with all units. In this way idle time while waiting for orders is decreased and other delays previously occasioned when using telephones are reduced.

To determine the practicability of VHF radio communication, test units were installed on one electric locomotive during 1937. Results derived from these tests over a period of years, proved conclusively that radio could be successfully employed, with many operating advantages as compared to the existing method of dispatching. World War II prevented the immediate continuance of this program. The present radio net-work has been in service only since November, 1949.

The present system consists of a fixed station located in the main dispatching tower with the transmitter operating on a frequency of 152 mc. Mobile-type transmitters and receivers have been installed in twenty-two 85-ton, 650-v. direct-current electric locomotives, whose transmitters operate on a frequency of 162 mc. The two frequencies of operation permit simultaneous two-way communication rather than the "push-to-talk" method conventionally employed. The two-way method was desired for convenience of the operating personnel and for reducing training time.

Each locomotive employs two antennae located on the roof, one being used for transmitting, the other for receiving. Inasmuch as the antennae are spaced approximately 20 ft. apart, the distance is sufficient to prevent blocking, which otherwise might be expected with the two-way method of transmission and reception.

CONVERSING BY TWO-WAY RADIO from cab of one of the 22 85-ton electric locomotives that haul copper ore out of the big pit at Chuqui.

System Reliable

To date, the radio system has proven to be a very reliable means of communication. The territory covered has an approximate radius of six miles. The dispatching station is so located that there are very few obstructions between this station and any section of the railway system, with the result that communication can always be established with the locomotives.

This method of radio communication has been so advantageous that additional units have been installed in automobiles used by certain members of the mine staff to expedite maintenance and other operations.

Lightweight Aggregate From Phosphate Slimes

DR. POOLE MAYNARD
Industrial Geologist
Atlantic Coast Line Railroad Co.
Atlanta, Ga.

OBSERVING THE VERY LARGE acreage comprising the settling ponds for storing the waste "slimes" from phosphate washing plants in Polk County, Florida, I obtained an analysis of the slimes in the west settling area of American Agricultural Chemical Co.'s No. 2 washer from W. N. Simpson, chemist. This was in the summer of 1944. The analysis suggested that these slimes could be used for making lightweight aggregate as well as glass fibers for insulation.

Samples were rolled into pellets by hand and fired in a laboratory furnace at 2,000° to 2,100°F. A cellular structure was noted at a temperature as low as 1,750°F. The pellets bloated nicely.

Tonnage Large

This waste material, in its natural state, is part of the matrix of the land pebble phosphate deposits of Florida. In processing the minus-150-mesh material, most of which is minus-300-mesh, the waste finds it way to the settling ponds. These ponds are often 100 acres or more in area and the slimes as much as 9 ft. or more thick.

This material is now accumulating at the rate of over 3,000,000 tons annually. Many millions of tons are already available in abandoned or almost abandoned areas.

Subsequently, when inquiry was made as to the existence in Florida of a material suitable for making lightweight aggregate, I suggested these waste phosphate slimes. Experimental work was undertaken, with the cooperation of W. D. Outman, Washington representative of the Florida Department of Agriculture. The product Mayolite, which resulted from this test work, has been so named after Florida's Agricultural Commissioner Mayo. The waste reject from the phosphate washing plants is dealt with in Bureau of Mines Report of Investigations 4401, page 88, and in a paper of the American Concrete Institute (*Journal*, Vol. 20, May, 1949, R. W. Kluge and others).

The problem of processing the "slimes" where they represent only 5% or less in solids in suspension and discharged to the settling ponds has not been undertaken. It was easy to observe, however, that "slime" beds already abandoned comprise a tonnage running into millions, which after some drainage has been done will not carry more than 55% moisture.

It is proposed to take advantage of time and sunshine and to tear away a portion of the dikes surrounding these slime beds; to provide a sump to drain off all moisture possible and to mine the slimes with a drag cable scoop and a hoist and to store them in open storage with underlying tile drainage. Slimes with 55% moisture could be stored easily in this way.

Processing as Tried

Processing the slimes on a commercial scale, as indicated by the test work, will involve mixing in a pugmill followed by extrusion, using a cluster die to give different sizes. Extrusion will be followed by drying and the dried product sent to storage or to a rotary kiln for further firing.

Naturally, there is a variation in the composition of the slimes, just as in the composition of the phosphate product obtained by washing. Apparently, however, there are not sufficient differences in composition to alter the quality of the product. The principal difference would be in the content of quartz, which has little or no effect on bloating unless greatly in excess over the other constituents.

With the experimental firing done, the following has been noticed:

1. The material begins to bloat at 1,750°F., with the best bloating at 2,000°F., although the temperature could be carried 100° or more higher without melting. Sticking occurs at 2,100°F., but the material easily breaks apart when jarred.

2. Apparently the material can be fired just as well at ½-in. diameter down to 5/16 in., so that it will not be necessary to fire various sizes separately. Smaller sizes were found to lack strength.

3. While all material so far has been fired under predominantly reducing conditions, the oxidized material seems just as desirable.

The market value of such a lightweight aggregate now would be about $5 per cubic yard. Mayolite has a weight of approximately 30 lb. per cu. ft.

As the material is mined with 55% moisture, the solids would be 1,600 lb. in each ton. Taking into consideration about 8 to 9% of ignition loss, there would remain about 1,000 lb. of solids. One cubic yard of Mayolite will weigh 810 lb. so that each ton mined with 55% moisture will yield about 1.5 cu. yd. of aggregate. A material which would average about 50% solids, when fed to a 9 x 90-ft. rotary kiln, with a loading capacity of 12% to 15%, would produce about 20 tons an hour, fairly close to 500 cu. yd. in 24 hours.

Glass Fiber From Slimes

Chemical analysis of the "slimes" indicated that by the addition of limestone or dolomite, lightweight glass fibers might be made. Appeal was again made to the Bureau of Mines for help. R. G. Knickerbocker, of the Rolla Station, with S. M. Malloy, found, after trying out the Florida Ocala limestone and the Florida Sarasota dolomite, that a good magnesium aluminum silicate glass could be made, using about 75% Florida "slimes" and 25% dolomite.

As to Origin of the Slimes

I would not omit a discussion of the origin of these slimes, inasmuch as it was my interpretation of their origin that suggested that they could be utilized as proposed.

For many years I have been under the impression that the land pebble phosphate and the associated slimes deposits are essentially apatites. They have a higher fluorine content than even the usual apatites. These Polk County phosphates have been derived from oceanic volcanic action in the Gulf

of Mexico and the Atlantic Ocean.

The "slimes," an intimate part of the matrix, have always in the past been ignored by geologists who have proposed theories of origin of the pebble phosphates, referring to the "slimes" as clay.

Alteration has taken place throughout the matrix; hydration of the apatite to collophane, the action of CO_2 and SO_3 and the acid water bringing about enrichment; wave action has brought about an accumulation of deposits of variable thickness on the unconformable Hawthorn, or whatever unconformable surface there was, but the matrix is exclusively of marine origin; there were no rivers of any moment which fed into this area; there are no clays in the matrix but the slimes are a phosphatic volcanic ash; the silica in the matrix, both that in the pebble and in the slimes, is crystalline quartz and is of volcanic origin. I have observed such quartz in montmorillinite deposits found in Georgia.

The silica in the "slimes" is practically all crystalline, no matter how fine. It is easy to so conclude with the naked eye, with the microscope, and from chemical analysis.

Practically all the iron and alumina are soluble in 20% sulphuric acid at water bath temperature. The combined silicate of alumina is in such small amounts that we cannot refer to the "slimes" as clay.

If the "slimes" had been transported by rivers and had been derived from the Hawthorn up-state, then the sand would be iron-coated, inevitably true of transported river sands in the south.

Dr. T. N. McVay, in a letter of Nov. 14, 1948, says:

"I feel reasonably certain the "slimes" contain apatite crystals. All of the optical properties could not be determined. Also, collophane. The material effervesces to a certain extent in cold nitric acid and does not contain carbonates."

The "slimes" also carry some halloysite, albite, microcline, sericite, dolomite and kaolinite.

I can list the elements of igneous origin contained in the matrix, such as boron, lead, beryllium, molybdenum, tin, copper, titanium, silver, nickel, manganese, chromium, vanadium, barium, strontium, zinc and fluorine.

In my opinion the "slimes" are a phosphatic volcanic ash.

I am indebted to Dr. O. C. Ralston, of the U. S. Bureau of Mines, J. E. Conley, of the Bureau's College Park Station, Dr. McBurney, and R. W. Kluge, of the U. S. Bureau of Standards, Joe Weaver and Mr. Wright, of the American Cyanamid Co., R. B. Fuller, of International Minerals & Chemical Corp., W. D. Outman, of the Florida Department of Agriculture, and to the Bureau of Mines and the Bureau of Standards for their real cooperation and many tests.

U.S.G.S. Appraises Brazilian Iron and Manganese Deposits

AN INDICATION of large reserves of high-grade iron and manganese ores in Brazil is seen in an appraisal of the deposits discovered and the tonnages estimated in certain areas surveyed cooperatively since 1940 by members of the U. S. Geological Survey, according to the Secretary of the Interior, Oscar L. Chapman.

Accurate appraisal of the overall tonnage that could be developed is not possible at this time because detailed geological surveys are incomplete. However, investigations, now being expanded under the Point Four program, have verified existence of the two largest deposits of high-grade manganese known in the Western Hemisphere.

These include an estimated 33 million tons in the Morro do Urucum area of Mato Grosso, near Corumba and the Bolivian border, and an estimated 7 million tons in the Serra do Navio district, Territory of Amapa, just north of the Amazon.

Rich deposits of high-grade iron ore have also been found in the Morro do Urucum area. Of the manganese reserves reported there, aggregating about 4,420,000 metric tons of measured ore, 11,750,000 metric tons of indicated ore, and 17,500,000 metric tons of inferred ore, the average content is reported to be 45.6% manganese and 11.1% iron. In addition, 1,310,000,000 metric tons of banded hematitic iron formations reported are expected to average about 55% iron and 20% silica.

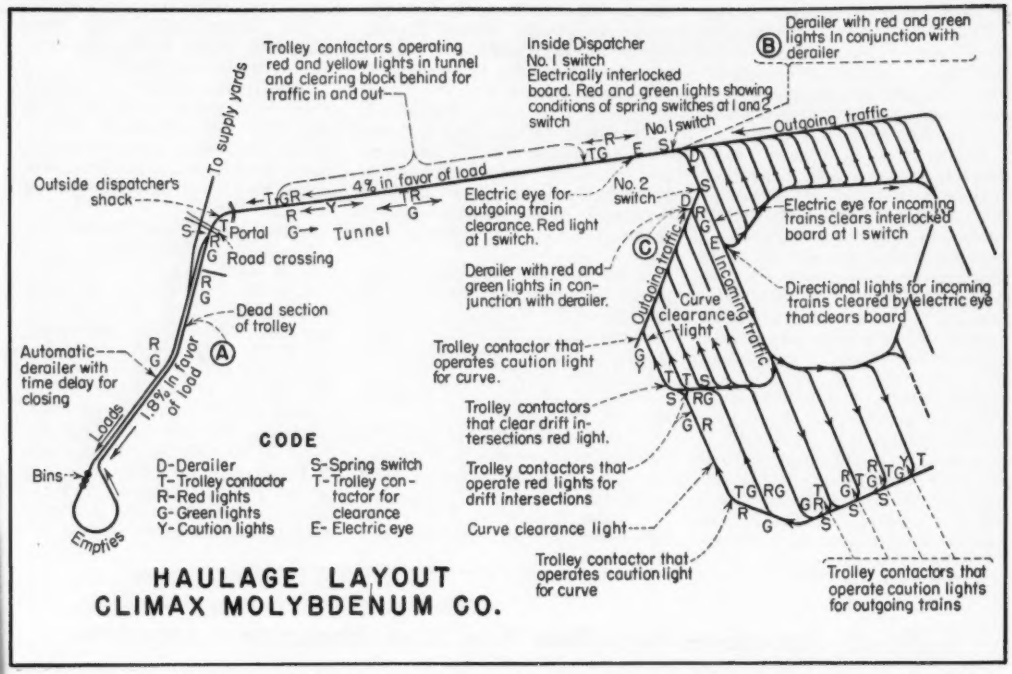
It was also found that detrital iron ore has accumulated on the slopes of the mountain in the Morro do Urucum area. In the one area prospected, there is about 450,000 metric tons per meter of depth of indicated ore and between 500,000 and 800,000 tons per meter of depth of inferred ore. After screening, this ore is expected to average about 64% iron and 4% silica.

In the Serro do Navio district of Amapa, 28 separate deposits of manganese oxide outcrops have been uncovered in the tropical rain forest on the banks of the Amapari River in an area 7 km. long and 1 km. wide. Many of these outcrops rise in sheer cliffs of high-grade ore to heights of 20 meters or more, ranging in length from a few meters to more than 250. This ore averages about 50% manganese on outcrops. Tonnage is estimated as: visible, 585,000 metric tons; probable, 2,700,000 metric tons, and possible, 4,000,000 metric tons.

Under the expanded cooperative minerals investigation program, authorized by the International Development Act for Point Four assistance, the U.S.G.S. is helping Brazilian technical men determine how much iron ore is contained in a mountain range in Minas Gerais, which state is northwest of Rio de Janeiro.

The most promising work in the Minas Gerais area is now well started but it will be some years before adequate data are available. Long ridges of itabirite (metamorphosed iron formation), in the south-central part are said to be punctuated here and there with large deposits of good ore. Past estimates, it is said, however, may be erroneous because the hard iron ore is resistant to tropical weathering and crops out boldly, causing early prospectors to overestimate the percentage of hard ore and underestimate the amount of softer ores, seldom seen as outcrops.

Recent exports from this area have been confined largely to the hard high-grade lump ore, mostly obtained from Caué Peak in the Itabira district, operated by Cia. Vale do Rio Doce exporting via Vitoria, and Casa de Pedra mine of the National Steel Co., near Congonhas do Campo, which sends its production to the steel plant at Volta Redonda. Other smaller mines near Brumadinho and Belo Horizonte are worked largely by hand methods and export the ore that is produced through Rio de Janeiro.


Trolley contactors operating red and yellow lights in tunnel and clearing block behind for traffic in and out
Inside Dispatcher
No. 1 switch
Electrically interlocked board. Red and green lights showing conditions of spring switches at 1 and 2 switch
Derailer with red and green lights in conjunction with derailer
To supply yards
Outside dispatcher's shack
4% in favor of load
No. 1 switch
Outgoing traffic
Electric eye for outgoing train clearance. Red light at 1 switch.
No. 2 switch
Electric eye for incoming trains clears interlocked board at 1 switch
Portal
Tunnel
Road crossing
Derailer with red and green lights in conjunction with derailer.
Directional lights for incoming trains cleared by electric eye that clears board
Dead section of trolley
Curve clearance light
Automatic derailer with time delay for closing
Trolley contactor that operates caution light for curve.
Loads
1.8% in favor of load
Trolley contactors that clear drift intersections red light.
CODE
D-Derailer
T-Trolley contactor
R-Red lights
G-Green lights
Y-Caution lights
S-Spring switch
T-Trolley contactor for clearance
E-Electric eye
Bins
Trolley contactors that operate red lights for drift intersections
Empties
Curve clearance light
Trolley contactor that operates caution light for curve
Trolley contactors that operate caution lights for outgoing trains
HAULAGE LAYOUT
CLIMAX MOLYBDENUM CO.

SINGLE-TRACK TRAFFIC in the 3,000-ft. tunnel is controlled chiefly by a dead section of trolley at "A", and two derailers, at "B" and "C". Red, green, and yellow lights regulate smooth flow of traffic in tributary haulage drifts.

Automatic Traffic Controls

Climax Molybdenum Co.'s operating crews have hauled as many as 51 loaded trains per 7½-hr. shift through a single-track tunnel. Such performance requires a virtually fool-proof traffic control system to avoid wrecks and delays. Read here how the staff at Climax accomplished this.

TRAFFIC CONTROL at the Climax Molybdenum Co.'s operations at Climax, Colo., has required careful planning chiefly for these reasons: (1) All trains carrying ore and supplies in or out of the mine have to pass through a 3,000-ft. single-track tunnel. (2) Outgoing trains depart from two different out drifts located 400 ft. apart. (See map.) (3) High production demands make a round trip with a single train impossible. (4) Train dispatching was carried on by telephone conversation between the train crews and the inside and outside train dispatchers.

To aid in this dispatching problem, the following control system has been installed: Electrically-controlled derailers have been installed on both out tracks. (At "B" and "C" on the map.) A section of dead trolley was installed on the in and up-grade at "A". This section of dead trolley may be energized by the outside dispatcher, provided his switch in turn is energized by the inside dispatcher.

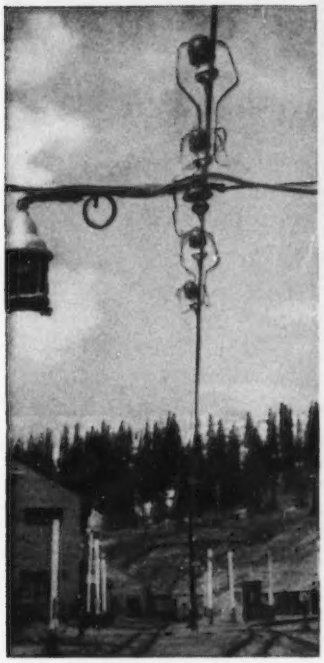
Controls Provide Safety

Operation of controls by the inside dispatcher is performed on an electrically-interlocked board that prevents the operation of more than one control at a time. Outgoing trains must pass through closed derailers and by the inside dispatcher before the opening of either derailer. Incoming trains must clear an electric eye a train length beyond the last outgoing track which in turn clears the interlocked board.

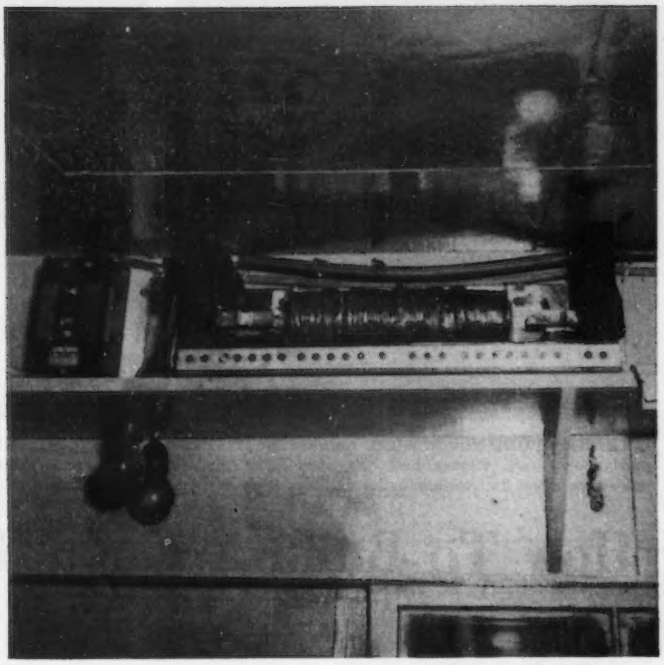
Although the foregoing system is not entirely foolproof, mistakes could only result if both dispatchers forgot the same thing at the same time, and this is unlikely.

Trolley contactors that activate solenoid switches controlling stop lights and caution lights are used to maintain safe train spacing in the portal, at drift intersections, and behind trains on blind curves. Safety controls such as these are particularly necessary because a loaded train (320 to 350 tons live plus dead weight) traveling at 10 to 15 mph. cannot stop in less than 500 to 700 ft. The entire system of trolley contactors, and yellow, red, and green lights is shown graphically in the accompanying map of the haulage system.

These controls and regulations have reduced train collisions to a minimum, and have not slowed up traffic. As many as 51 loaded trains have been hauled in one shift.

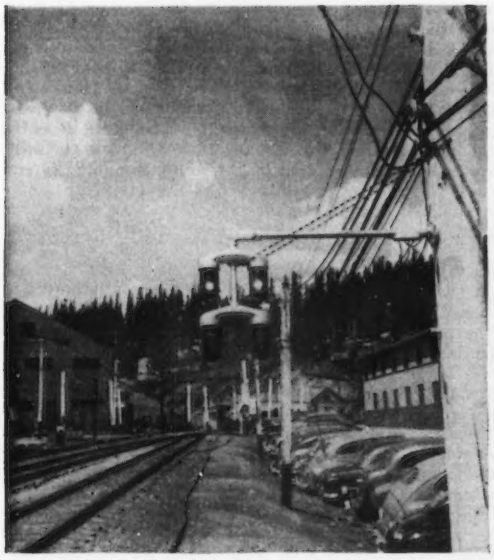


1 TROLLEY SHOE on locomotive engages contactor above.



2 TWO-WAY SOLENOID above is actuated by contactor shown at left. The solenoid in turn operates red and green lights on the haulage system.

Permit Faster, Safer Haulage



3 WEATHERPROOF red and green lights operated by solenoid above control traffic entering the tunnel.

4 EMPTY TRAIN at dead section of trolley awaits go-ahead signal which will permit it to enter tunnel.

MAKE THE POND PLENTY BIG. Note size of Telluride's pond shown here. Higher first cost of a large pond is more than offset by later savings in tailings disposal costs.

CONSTRUCT EMERGENCY DIKE below the dam. If spills occur, the tailings will be impounded until repairs can be made. Note the emergency dike in foreground.

How To Build A Good Tailings Dam

ONE OF THE SERIOUS PROBLEMS in mine operation in Colorado is tailings disposal, particularly if the tailings dam goes out with a sudden spring thaw and results in an avalanche of complaints and threatened suits from ranchers for miles down the creek. Because Telluride Mines, Inc., Telluride, Colo., has succeeded in constructing a stout dam which holds very well, and costs relatively little to maintain, we asked John Ferguson, mill superintendent, to point out some of the important features of the tailings dam. Here are Mr. Ferguson's suggestions:

1. Don't be skimpy when you start building a tailings dam. Lay it out so that the pond will be big enough.

2. Construction of an adequate tailings pond may be costly at the start, say from 16 to 17c. per ton of tailings disposed, but after the system starts working properly, these costs will drop as low as 2½ to 3c. per ton, and very little labor will be required to maintain the dam.

3. When filling tailings ponds, don't jump around from pond to pond. The drainage cuts off once you stop, and you can't resume operations without a lot of trouble.

4. Clean the surface upon which the dam is to be built down to clean gravel. If gravel isn't present, haul in coarse aggregate to serve as a base for the dam. This will act as a filter. If necessary, use a bulldozer to cut out a good dam base. (See illustration.) Otherwise the bottom of the dam might slip out when pressure develops. Weeds and brush, if left in place, act as a lubricant and can help cause a tailings dam to break out.

5. The secret of building a good dam in areas where freezing sets in, is to make the ponds large enough, and secondly to stock the tailings around the edge excessively during the warmer months of the years so that tailings delivered during the heavy freezing months can be diverted to fill in the center of the pond. In this way you avoid the formation of large wet masses in the dam which freeze in winter, and let go during a thaw in the following spring.

6. It is very important that the sands be packed firmly around the rim of the dam. At Telluride the spouts are purposely maintained high enough so that the sands will drop at least 3 ft. and thus pack finmly in place. The present solid exterior walls of the dam are ample proof of the value of this principle. (Note in the photographs how steep the face of the dam is.)

7. If space is available, build an emergency dike around the foot of the dam and some distance therefrom. Then if any small breaks or spills occur, the tailings will be impounded in the outer area until the break can be repaired.

6. Plan an adequate drainage system to carry off the excess clear water of the pond. Vertical risers, 4x1 ft. in cross-section, constructed of heavy timber are used at Telluride to carry off the overflow. (See illustration.) These risers can be raised from time to time as the level of the pond rises. The bottom of the risers connects with a wooden launder 1 ft. square in cross-section, constructed of 3x12-in. timbers, which carries the overflow through the dam and into the creek below. An adequate drainage system is especially important if heavy rains are common in an area. In locating drains it is advisable to plan well ahead, for if your dam is expected to last for 10 to 15 years, the position of the drains for later run-off will vary considerably from the position of drains used during the early years of the pond's life.

(Editor's note. Just for the record, it might be mentioned here that the settling pond at Telluride is so clear and attractive that ducks—as many as 60 or 70 at a time—have chosen this as a landing spot. In fact, beaver have attempted to dam up the pond the easy way by piling brush around the tops of the wooden drains, with the result that the company had to call the State trapper to clear them off the pond.)

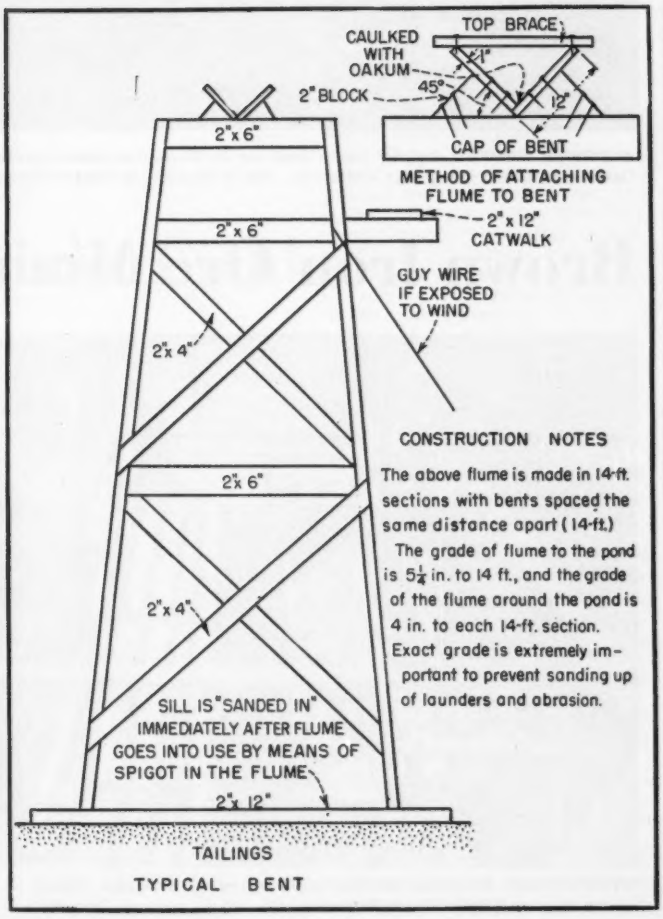
E&MJ expresses its thanks to C. F. Parker, Jr., manager of Telluride Mines, Inc., and A. C. Hilander, chief engineer, for assisting in the preparation of this article.

BUILD DAM WITH A CLEAN GRAVEL FOUNDATION. John Ferguson, mill superintendent, points out a dam base that has been bulldozed to expose clean gravel.

ALLOW SANDS AT EDGE OF DAM TO DROP AT LEAST 3 FT. to form compact dam. Frank Blackburn, operator, checks stacking of solids.

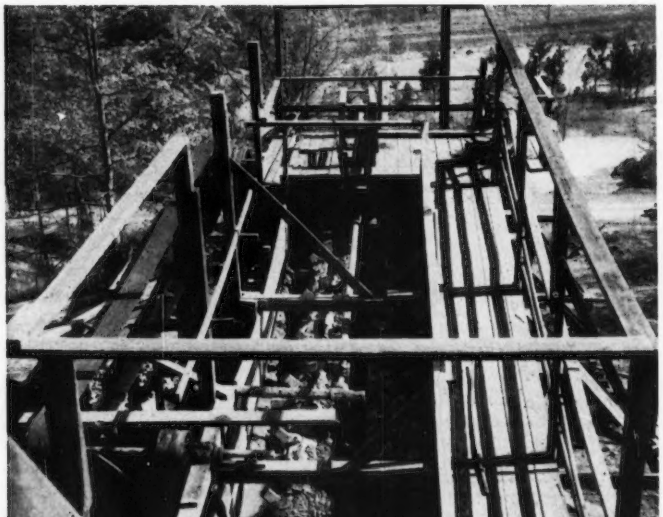
PLAN ADEQUATE DRAINS for pond run-off. Vertical riser (above) connects with sub-surface drain. Riser can be raised by nailing on more boards.

BUILD UP DAM DURING WARM MONTHS of year, and divert the tailings to the center of the pond during freezing months as shown here.


TOP BRACE
CAULKED WITH OAKUM
1"
45°
2" BLOCK
12"
2"x 6"
CAP OF BENT
METHOD OF ATTACHING FLUME TO BENT
2"x 6"
2"x 12" CATWALK
GUY WIRE IF EXPOSED TO WIND
2"x 4"
CONSTRUCTION NOTES
The above flume is made in 14-ft. sections with bents spaced the same distance apart (14-ft.)
The grade of flume to the pond is 5½ in. to 14 ft., and the grade of the flume around the pond is 4 in. to each 14-ft. section. Exact grade is extremely important to prevent sanding up of launders and abrasion.
2"x 6"
2"x 4"
SILL IS "SANDED IN" IMMEDIATELY AFTER FLUME GOES INTO USE BY MEANS OF SPIGOT IN THE FLUME
2"x 12"
TAILINGS
TYPICAL BENT

A POWER SHOVEL digging brown iron ore at E. L. Gammage's Grady mine, near Cedartown. This is typical of many operations in district, which stretches from northeast Georgia over into adjacent Alabama.

Brown Iron Ore Mining Active in



TYPICAL LOG WASHER OPERATION, as seen at Arrington Mining Co.'s brown iron ore property near Piedmont, Ala., 12 mi. west of Cedartown, Ga.

E. DALTON WHITE
McGraw-Hill Atlanta Bureau

THANKS TO THE DEMAND being made on the steel companies to produce a record tonnage for defense, the brown iron ore industry of northwest Georgia and adjacent Alabama is showing increased activity, centering at Cedartown, some 50 miles northwest of Atlanta. These ores average about 40% iron, with a varying content of manganese. They normally find a market in the Birmingham-Gadsden district. The need for getting costs down is bringing about a high degree of mechanization and efficiency in mining. Construction of a beneficiation plant in the mining area is being considered.

A mining operation typical of this area is C. B. Arrington's Sidhart mine, 12 miles west of Cedartown. Mr. Arrington has a lease on 10,000 acres, with 160 acres under development. The ore occurs in relatively large pockets. Most of the mining is done at depths which

WASHER of R. A. Wade & Co., southeast of Anniston, Ala., is built on hillside to utilize gravity flow. Chutes allow quick truck loading.

Georgia-Alabama Field

permit the use of power shovels and trucks. Tests indicate that the ore is better at lower levels and proposals are being made to mine it at these levels.

Prospecting is done by digging test pits every 100 ft. with well drills. Some outcrops are prospected by bulldozer and trench digger. Overburden is stripped by power shovels and hauled to nearby dumps. Minable material yields on the average about one ton of ore to 4 tons of material mined.

Power shovels load into 5-cu.yd. trucks, which haul the crude ore half a mile to a mile to the washing plant. Four trucks are required to supply 250 tons to the washer per 12-hr. shift. The crude is dumped into a chute where it is sprayed with water with a 1-in. nozzle at 75-lb. pressure to remove as much dirt as possible. The chute delivers to a grizzly with 4-in. spacing. The undersize goes to a 30-ft. log washer. The plus 4-in. ore and rock is hand-sorted, the ore going to a 20x26-in. Pioneer jaw crusher set to 4 in. and the rock to a conveyor belt running to the dump. All minus 4-in. material from the crusher goes to the log washer and from here to a 4x8-ft. Seco double-deck vibrating screen, the upper deck of which has ½-in. openings and the lower 12-mesh. The screens discharge to a conveyor belt which takes the ore to storage.

Fines in the log overflow go to a settling tank which is connected to the waste launder. If they contain sufficient iron, they are sent to ore storage via an elevator and belt conveyor. If the fines run high in sand, all is flushed to waste. All material passing the 12-mesh screen following the log also goes to this settling tank.

Seven Men on Shift

The washer requires two men on the grizzly, one on the nozzle at the chute, two on the washed ore belt, and a foreman who regulates the water on the job, also the flow of ore from the washer, and is in charge of maintenance. One man is required to look after the dump, also to repair the dykes.

A 150-hp. Cummins diesel engine operates the washer. Water is pumped from the nearby creek by a No. 4400 Caterpillar 200-gpm. pump to empty into a water-storage pond next to the washer. Flow from the pond is by gravity to a pump.

Ore from the washer is trucked to the railroad nearby.

Washed ore at the Sidhart plant runs 40% iron, sometimes as high as 56%; the silica will be around 14% up to slightly over 30% in spots. Manganese content is from 0.05 to 0.50%, and moisture runs between 8 and 9%.

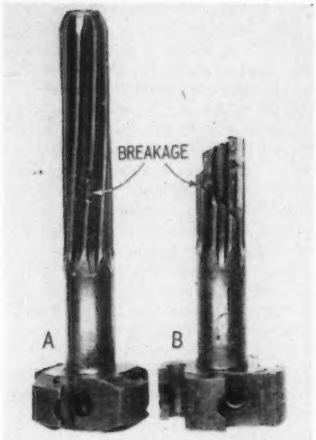
The steel companies will take ore with iron as low as 36%, that is, iron plus manganese, with phosphorus below 0.10%.

In the past the mining companies have depended mostly on experience in determining whether a shipment would be acceptable to steel furnaces. Recently Tennessee Products & Chemical Co. set up a laboratory to test all shipments consigned to its plants. This laboratory is proving of great value to the mining industry in the area in guiding pit as well as washer operations.

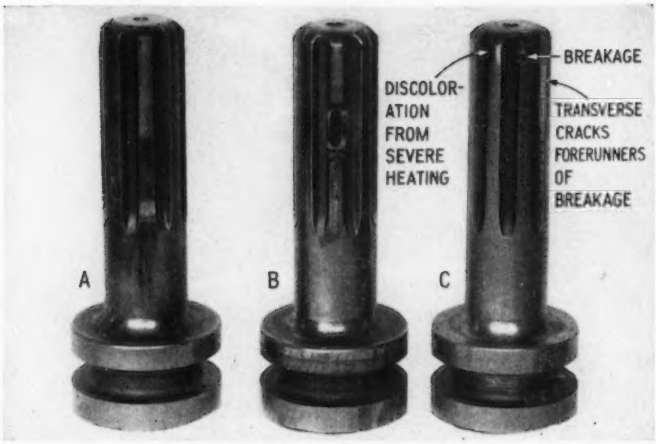
Activity throughout the area has increased and exploratory work on a larger scale is under way. It is felt that should an ore-processing plant be established in the area, iron mining in the district will have greater importance.

Typical Analyses of Brown Iron Ore, as Determined in Tennessee Products & Chemical Co.'s Laboratory at Cedartown

	Iron	Manganese	Insolubles	Phosphorus
Albea-York Mining Co., Oremont	47.50	0.86	15.62	0.144
C. B. Arrington Mining Co., Sidhart	45.32	0.91	22.36	0.763
E. L. Gammage Mining Co., Cedarcreek	53.20	0.17	9.96	0.272
Albea-York Mining Co., Oremont	38.60	0.82	29.84	0.168



1. THESE RIFLE BARS failed because of poor lubrication despite use in them of materials most resistant to damage from sliding pressure.



2. IN THESE PISTON HAMMER FAILURES, "A" and "B," a piece has broken from spline due to seizure, followed by cracking and completion of crack. "C" shows piece chipped out of driving side of one spline, also discoloration, due to heating, which may be seen at top of spline to left of this.

Reduce Drill Part Breakage With Proper Lubrication

F. R. ANDERSON
Metallurgist
Gardner-Denver Co.
Quincy, Ill.

RAPID WEAR OF MACHINE PARTS is accepted as inevitable by anyone familiar with machinery if lubrication is deficient. That this is logical is well demonstrated when an oil reservoir is allowed to run dry or some critical contact area of a machine is allowed to go ungreased. Likewise, seizure and galling are accepted as a result of the failure of lubrication; running surfaces becoming rough so that free motion is restricted or prevented. In short, it is recognized that ample, correct lubrication is necessary to ensure smooth operation of machines.

Unfortunately, fewer people realize that deficiency in lubrication can cause breakage of metal parts. This is particularly true of highly hardened steel parts, subjected to rapidly applied loads of a high order. Rock drill parts are so loaded

3. TRANSVERSE CRACKS are visible on driving side of spline at extreme right. Such cracks progress under repeated impact into spline to cause breakage. An oil film between running surfaces will check surface temperature rise.

4. THE TRANSVERSE FRACTURES of these two piston hammers started with cracks that formed on top of splines due to scoring in cylinder bushing. Large diameter surface of hammer on right also shows scoring. See also Photo 5.

5. FRACTURE FACE, enlarged, of one of the broken piston hammers shown in Photo 4. Origin of failure is at center concentric rings, which can be seen faintly in upper right. Sequence of events from poor lubrication to fracture is the same.

in service. The purpose of this article is to illustrate and describe breakages of rock drill parts that have been caused by lubrication deficiency.

Failures Illustrated

Photograph I shows two rifle bars which have been broken in service because of inadequate lubrication. The one marked "A" had a piece about half an inch long broken from one of its spiraled flutes. The other had broken in a spiral path to develop a complete break through its cross-section. Both failures had their origin in small cracks on the side of the flutes, which progressed under the repeated stresses of operation to the complete failures seen. The spiraled splines of the rifle bar engage corresponding internal splines of a bronze nut which is reciprocating while at the same time transmitting a high torsional force. This results in a high sliding pressure which requires the use of a bronze nut to prevent early damage to the hardened steel rifle bar. Despite the use of materials most resistant to damage from sliding pressure, lubrication of high quality is necessary to prevent such failures.

Two rock-drill piston hammer failures are shown in "A" and "B", Photo 2. In both cases, a piece has broken from a spline due to seizure, cracking and progression of the crack to completion. Original cracking had been caused because extreme pressure lubricant was lacking to separate the top of the hardened steel hammer splines from the bronze cylinder bushing. Again, the cause was the same, high sliding pressure in the absence of lubrication. Evidence of heating and scoring is visible in the discolored streaks on each side of the piece broken out. The large diameter of each piston also shows lengthwise streaks due to scoring between the hammer and cylinder. These streaks are discolored to the extent that surface temperatures exceeding 1,000° F. are indicated.

The piston hammer shown in "C", Photo 2, has a piece broken from the driving side of one spline toward its upper end. The spline to the left shows a discolored area caused by severe heating during operations, the colors indicating temperature values approaching the melting point of steel. Transverse cracks are visible on the driving side of the spline to the extreme right. These cracks are the forerunner of breakage of the piece from the side of the spline. Again, there is the presence of the discolored areas on the large diameter surfaces.

An enlarged view of a damaged piston hammer is shown in both "A" and "B", Photograph 3, in which many transverse cracks are visible on the driving side of the splines. While these cracks, in themselves, are harmless, they progress to cause gross breakage. Close inspection shows their progress into the body of the spline.

In analyzing formation of cracks resulting from sliding pressure in the absence of lubrication, it has been established that high surface temperatures are reached. If an oil film separates the running surfaces, temperature rise is moderate. On the other hand, if metal-to-metal sliding occurs, the very surface reaches the molten state, about 2,600° F. As severe surface heating takes place, the surface layer must expand, this tendency being satisfied by a bulging in an outward direction. The subsequent cooling is accompanied by a corresponding contraction, the severity of which causes cracks to form. Once a surface crack has formed, the end has begun for a part subjected to repeated impact because the crack progresses until complete breakage has occurred.

The two piston hammers in Photo 4 have broken transversely, failure progressing from cracks formed on the top of the splines due to scoring in the cylinder bushing. Some scoring has occurred on the large diameter surface of the hammer on the right. An enlarged photograph of the fracture face of one of these hammers is shown as Photo 5. A series of concentric rings in the fracture pattern has a common center which represents the origin of failure. The origin has actually been on the side of the spline in which the center is located. Again, the sequence of events has been the same: lack of lubrication, surface heating, surface cracking on cooling, progression under repeated impact of one of the cracks to complete fracture.

Two Factors in Lubrication

Proper lubrication of a rock drill involves two principal factors, as follows:

(1) Selection of the proper lubricant.

(2) Assuring continuous presence of the lubricant on working surfaces at all times during operation.

The former factor is satisfied by using a mineral oil of correct viscosity to assure uniform feeding at temperature of operation, to which oil compounds have been added to assure emulsification with water and extreme pressure characteristics. Viscosity may vary from SAE No. 10 to SAE No. 40; the former for extremely low temperatures, the latter for very high. Remember, viscosity controls oil flow or feeding during operation. Oil that will not flow freely cannot reach the points needing it. Ability to combine with water, called emulsibility, assures lubrication despite the presence of the washing effects of water. Many rock drills must operate in the presence of large quantities of water and the oil must resist such action. The last property, that of extreme pressure-carrying ability, is of greatest importance and is a property conveyed on oil by virtue of compounds added to it. A properly compounded oil can sustain enormous loads without metal-to-metal contact occurring. On the other hand, a straight mineral oil will fail at low loads, permitting metal contact, heating, cracking and eventual breakage. Almost all of the reputable oil companies offer their customers rock drill lubricants embodying these properties.

Making Sure That Lubricant Is on Working Surfaces

The second factor depends on the method of oil feeding employed and the care exercised in maintaining an adequate oil supply. Modern rock drills employ an integral lubricator built into the machine or an air-line oiler situated in the air line immediately ahead of the machine. Both are good if the oil reservoir is kept supplied with oil. A still better type is one which shuts off the air supply if the oil chamber becomes empty. Rock drill design requires continuous lubrication and it has been carefully engineered to simplify the problem of ensuring ample oiling. The fact remains, however, that all too frequently oil feeding is allowed to lapse and damage to parts in the form of breakage will usually result.

Remember that a series of events, having their origin in improper lubrication and their finis in breakage, can be prevented by observation of proper oil selection and its continuous use. As has been shown, breakage, as well as wear, can, and does, result from lubrication deficiency.

KEEPING TAB ON PRACTICE

Grizzlies and Chutes vs. Mucking-Machine Drawpoints. Explaining why the popular "mucking-machine drawpoint" system is losing ground in Consolidated Beattie's mine at Duparquet, Que. (*E&MJ*, Feb., 1951, p. 115), in favor of grizzlies and large chutes like the one in the sketch, R. S. Haflidson, chief engineer states that better efficiency is gained with grizzlies and chutes in two ways:

1. Coarse muck can be broken up more easily and more cheaply in grizzly chambers because blockholing facilities can be permanently installed and blasting can be done continuously without delay for removing the loader.

2. Fine muck can be loaded into cars more easily and faster with well-equipped chutes than with loader.

These two factors are reflected in performances per man-shift. To illustrate, Mr. Haflidson states that on their 5th Level haulage performance per man-shift with the mucking drawpoints used to be 25 tons per man-shift, whereas with the new grizzly-chute set-up, performance averages from 40 to 50 tons per man-shift. A man-shift costs about $9.20, so the labor saving is 37c. minus 23c., or 14c.

The saving in secondary powder ranges from 1 to 2c.

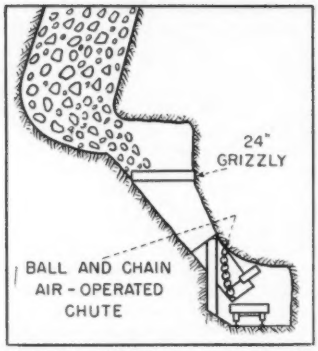
Besides these direct savings, the use of grizzlies make it possible to concentrate manpower at any desired point, in that two men can be used at each grizzly as well as the haulage crew below, whereas, with the mucking machine set-up extra men in addition to the loader operator do not help much. This can be an extremely important feature where the number of stopes being drawn is limited, Mr. Haflidson asserts.

Moreover, stoppages due to mechanical breakdowns are less with the grizzly-chute arrangement.

"The mucking draw-point of course has its place," says Mr. Haflidson. "For cheap and fast stope preparation with little ore tied up in pillars, we definitely agree that the drawpoint is tops and we *do* use them in places.

"However, where the objective is to handle large tonnages of coarse ore cheaply and quickly, we definitely favor the grizzly.

"As a very general rule, we use chutes alone under stopes up to 12 ft. wide, mucking draw-points under stopes 12 to 25 ft. wide and the grizzly-chute set-up under stopes over 25 ft. wide. For our conditions we find that this rule works out fairly well."



USE OF CHUTE and grizzly like this is finding favor with Consolidated Beattie in preference to mucking-machine drawpoint.

Auger Rods Carbide-Tipped for Serpentine. In discussing the use of tungsten-carbide bits with high-speed rotary drills in *E&MJ* for September, 1950 (p. 97) at the Umvukwe chrome mines, in Southern Rhodesia, it was said that efforts to tip auger rods with carbide had not been successful. J. W. V. Mortleman, manager of the Vanad mine (P.O. Concession, Southern Rhodesia), says that at his mine they have been using carbide-tipped auger rods almost exclusively since 1949, with detachable bits serving only as controls. The augers are tipped in the mine shop at a cost of about £2, whereas the detachable carbide bit costs £3.50.

Total footage drilled is about the same with each type, according to Mr. Mortleman, but the tipped rod has the advantage, if sludging very much faster than the detachable type. This is due to the uninterrupted flow of sludge past the cutting edges. The detachable bit tends to halt flow of sludge, which balls up behind bit.

In damp rock, sludging is all important and the tipped auger avoids the condition mentioned in *E&MJ*, July, 1950, p. 83, where bits have to be cleaned every six inches.

During a demonstration of drilling in damp serpentine schist before an official of the Southern Rhodesia Mines Department, a tipped auger drilled 96 ft. in 23 minutes, comprising 16 holes each 6 ft. long. In the same rock a stem with a detachable bit drilled two holes, each 3 ft. long, jamming on both occasions at this point. In each case clearance between bit and stem was 1/16 in.

Progress in Core-Drill Standardization. Equipment that has been standardized for core drilling is dealt with in an educational pamphlet put out by Diamond Core Drill Manufacturers Association. In working out standardization and interchangeability, care is taken to leave the way open for individual ingenuity.

X Series core barrels are standardized to the extent only of thread characteristics, inside and outside diameters of bits and the internal bevel of bits. All set bit and set reaming shell diameters are standardized, but other parts are not.

M Series barrels are completely standardized and all parts are interchangeable with the exception of internal parts of the core-barrel head.

The three sizes of double-tube core barrels larger than NX are completely standardized and all parts are interchangeable.

Complete standardization and interchangeability has been accomplished on drill rods and couplings, flush-coupled casing, casing couplings, casing bits and casing shoes.

All threads are right-hand unless otherwise indicated.

Better Bit for Undercutting. International Min. & Chem., Carlsbad, N.M., has a new undercutter bit in use in the (langbeinite) potash bed which it works on its 850 level. This has a plug of tungsten carbide set deep in the bit rather than a flat piece of carbide brazed to the bit top. The insert lasts longer, does not crack or peel off as easily as other inserts have done.

THIS CARBIDE-TIPPED AUGER successful at Vanad chrome mine

We Must Pay As We Go

***We** must do our utmost to pay as we go for our present defense program.*

On that proposition those who speak with authority are remarkably well agreed. This editorial – the second in a series on our mobilization for freedom – sets forth in simple terms why there is this agreement.

Next year – the fiscal year beginning next July 1 – the federal government's budget calls for the expenditure of $10 billion more than is scheduled to be collected in taxes. The deficit is due to the increase in defense expenditures.

A part of this deficit can be eliminated by cutting non-essential expenditures and increasing efficiency in the defense program. There is wide agreement on this. It is the duty of the President and Congress to see that it is saved.

How the remaining deficit anticipated in the federal budget–$5 billion to $10 billion–is handled is crucial. The government can meet it by raising taxes–by paying as we go. Or it can borrow, issuing more government bonds.

Borrow Again?

We relied heavily on borrowing in both World War I and World War II. In World War I only about one-third of the expenditures of the federal government were met by taxation. In World War II about 45 percent were met in this way. The rest we borrowed. Some people ask, why can't we rely heavily on borrowing again? Why is it crucially important to avoid adding $5 billion to $10 billion to a federal debt that is already $257 billion?

Part of the answer is found in the contrast between this defense program and our all-out effort of World War II. Another part–and one that is all-important in combatting inflation–results from the rapid decline in the purchasing power of the American dollar in recent years.

We went "all out" in World War II. We put almost half of everything we produced into our military effort. Taxes high enough to pay the financial costs as incurred would have meant huge tax increases. It was feared that such increases would kill financial incentives to get "all out" production. Since we expected the war to be short, borrowing seemed a safe expedient. Price control and rationing, with wartime patriotism to give them effective support, were relied upon to keep in check the inflationary pressure created by borrowing rather than taxing.

Our present defense program is scheduled to take a much smaller share of our production, but to take it over a much longer period. At its peak, the program as now planned will take only about 20 percent of our total national production. But, to use General Bradley's phrase, "the conditions under which we labor may persist for ten, fifteen and twenty years."

What About Controls?

For a period of any such duration it would be foolhardy to expect that the sort of controls we had for the few years of World War II could hold in check the inflationary pressure created by not paying as we go. It would be as foolhardy as it would be for a family to plan on borrowing to pay the expenses of a member discovered to be afflicted by a chronic ailment which might last a long lifetime.

Obviously, the only safe thing to do in such a case would be to adjust the family budget so that the expenses of the illness would be paid currently.

Our heavy reliance on borrowing in World War II had consequences which block a successful repeat performance.

If the borrowing had been done by persuading individuals to transfer their savings into government bonds, relatively little inflationary pressure would have been created. What the government would have spent with the proceeds of such bond sales would have been subtracted from the money individual consumers could spend.

But most of the borrowing was done from banks. That course expanded the amount of money available to the government without any offsetting subtraction of money from the hands of individuals. Thus, when direct price controls were removed after the war, this bottled-up purchasing power contributed to a price inflation which has cut purchasing power of the American dollar about in half – and decidedly changed the attitudes of the American people toward that dollar.

During World War II, Americans in general believed that:

The war would not last long.

The dollar would hold its value, and even gain value after the war.

Many wonderful new products would be available in the postwar period.

Today the American people have:

Seen the value of their dollars melt away fast.

Been assured that, at best, we may have a 10-15-20-year pull ahead.

Been warned not to expect a postwar paradise anytime soon.

One result of these changed attitudes is a notable lack of enthusiasm for government bonds on the part of individual investors. This is indicated by the fact that since Korea redemptions of E bonds have exceeded sales by about $600 million. Another result is a continuing rush to convert dollars into physical goods and equipment or claims on them. This trend weighs against financing the prospective federal deficit by borrowing from individuals.

Borrowing from banks to meet the deficit would again add fuel to inflation.

The prospective deficit is due to federal expenditures for military goods. Even if they are not blown up or shipped abroad, these goods will not be available to civilians. But the money paid to those who produce military goods will still be available to bid up the prices of civilian goods. Thus, at a time when people show relatively little disposition to save dollars, a menacing inflationary pressure – an inflationary gap, the economists call it – will be created.

If our fight against inflation is to be successful this gap must be closed by taxes. We need to do other things, too, for inflation has many different causes. Credit expansion must be effectively controlled. Production of civilian goods must be increased as much as possible by eliminating waste and inefficiency. But a pay-as-we-go tax program is basic to a successful attack on inflation. And inflation – unless it is checked – could wreck our defense effort.

We cannot pay as we go merely by soaking harder the corporations and those in the upper income brackets.

As the President's Council of Economic Advisers has reported, "by far the largest part of the additional revenue must come from the middle and lower tax brackets. These are the brackets in which the great bulk of the income is located."

Taxes Can Attack Inflation

By spreading tax increases broadly, taking small amounts from many people, inflationary pressure would be effectively reduced. It is the expenditures of the great mass of people, rather than the small numbers in the upper income tax brackets, that create most of the pressure. Moreover, it is possible to increase taxes broadly without killing the economic incentives to produce. Maintaining these incentives is essential to the success of the defense effort.

Our elected representatives cannot be expected to be enthusiastic about a pay-as-we-go tax program. It involves increasing the taxes of the great body of their constituents, an operation completely lacking in political glamour. However, such a program also involves the integrity of the American dollar. And that is absolutely essential to the success of the defense program. We shall be very foolish if we do not let our leaders know that we want them to do everything possible to pay as we go.

McGraw-Hill Publishing Company, Inc.

MARKETS—Trends and Prices *(Continued from page 69)*

Consumption of Slab Zinc

With imports shrinking, a possible recession in consumption of slab zinc in this country is not expected to result in an improved supply situation. At present, a smaller take for the Government's stockpile has been offset by increased shipments to the U.K. where the shortage in zinc is even more acute than in the United States. Slab zinc consumption in January declined 6% to 74,560 tons, according to the Bureau of Mines. Monthly average use of zinc in 1950 was 78,947 tons.

Consumers' stocks of slab zinc at the end of January totaled 58,925 tons, against 59,545 tons a month previous. Stocks in the hands of smelters as January ended totaled 10,212 tons.

Use of zinc in the United States in the six-months period ended January, by grades, in tons:

	Aug. 1950	Sept. 1950	Oct. 1950	Nov. 1950	Dec. 1950	Jan. 1951
Special High Grade	29,062	27,852	31,000	26,061	29,553	26,224
Regular High Grade	13,782	11,539	11,545	10,734	10,465	10,235
Intermediate	2,766	2,512	2,770	3,216	3,135	3,171
Brass Special	3,850	3,193	2,280	2,477	2,710	2,853
Select	328	252	191	37	119	249
Prime Western	38,192	35,840	36,084	34,172	32,992	31,548
Remelt	310	303	373	436	407	280
Totals	88,290	81,491	84,243	77,133	79,381	74,560

Official London Prices

Official delivered prices in the United Kingdom for copper, lead and zinc were unchanged throughout April. Quotations named by the British Ministry of Supply were as follows:

	Per Long Ton £	s.	d.
COPPER:			
Electrolytic, high conductivity	210	0	0
Fire refined, high conductivity	210	0	0
Fire refined, high grade	209	10	0
Fire refined, min. 99.7 percent	209	0	0
Fire refined, min. 99.2 percent	208	10	0
LEAD:			
Soft, foreign duty paid	160	0	0
Soft, Empire	160	0	0
English, refined	161	10	0
ZINC:			
Foreign (G.o.b.) duty paid	160	0	0
Domestic (G.o.b.) duty paid	160	0	0
Prime Western and debased	160	0	0
Refined and electrolytic	164	0	0
Minimum 99.99 percent	166	0	0

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

April 30, 1951

Aluminum, ingot, 99 plus percent, lb. (base price)	19c.
Antimony, spot, lb., 5 tons and up but less than carload in cases	45.300
Bismuth, ton lots, lb	$2.25
Cadmium, commercial sticks, delivered, lb	$2.55
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.07
Cobalt, 97 to 99 percent, per lb	$2.10
Indium, troy oz	$2.25
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	50½c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz	$24.00
Platinum (Official quotation wholesale lots) troy oz	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$215 @ $217
Selenium, 99.5 percent, lb	$3.00
Silicon, minimum 97 percent, spot, carloads, lb	16.50c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$12.50
Titanium, 96 to 98 percent, lb. (a) Includes U. S. duty.	$5.00

METALLIC ORES

Beryllium Ore, imported, 10 to 12% BeO, per unit	$28.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3, no ratio	$27.00 @ $28.00
48% Cr_2O_3 3 to 1 ratio	$43.00 @ $49.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$8.70
Mesabi bessemer	$8.45
Mesabi, non-bessemer	$8.30
Lead (Galena), 80 percent, Joplin, Mo., ton	$218.42
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.05 @ $1.10., c.i.f. U.S. ports, duty extra. Long-term contract quotations wholly nominal and matter for negotiation.	
Molybdenum Ores, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb	$2.00 @ $2.50
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, U.S. equivalent, duty extra	$65.00
Domestic, scheelite, 60 percent f.o.b. mine	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton (a) Nominal.	$115.00

METALLIC COMPOUNDS

Arsenious Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	6½c.
Cobalt Oxide, 72%, metallurgical grade, per lb. of Co	$2.25
Copper Sulphate, 100 lb	$8.95

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	21½c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$185.00
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	(a) $3.25
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, max. 1½ percent carbon, per lb. contracts	9.9c.
Spiegeleisen, per long ton, 19 @ 21 percent grade (a) Nominal.	$75.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$275 @ $475
Shingle fibers	$123 @ $170
Paper stock	$85 @ $119
Waste	$63 @ $70
Shorts	$30 @ $63
Asbestos, Vermont, f.o.b. Hyde Park:	
Shingle stock	$97.00 @ $107.00
Paper stock	$68.50 @ $85.00
Waste	$51.00
Refuse or shorts	$25.50 @ $46.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$9.25 @ $9.50
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $4.50 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois, 70% effective, CaF_2, ton	$43.00
Acid 97% concentrate, bulk, ton	$50.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$36.30
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $150 per ton. Bulk sales, dry ground, 32.50 @ $70.00 per ton. Scrap, $32 and up.	
Ocher, Georgia, ton, in sacks	$24.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	(a) 12 @ 14c.
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored (a) Nominal.	$30.00

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$52.00
Steel, f.o.b., Pittsburgh billets, net ton	$56.00
Structual shapes, 100 lb	$3.65

WASHINGTON IMPACT

Nickel and Copper Projects Head List For DMA's Assistance

Two big projects—one in nickel and one in copper—top the list of mineral development programs which DMA thinks may get underway before the end of this fiscal year, June 30. Chromite is next in importance, in terms of dollars which might be spent. Trailing along behind the leaders are projects in zinc, iron ore, antimony, fluorspar, manganese, and tungsten. Altogether these projects might require something in the neighborhood of $172,000,000 in new financing and $4,460,000 for purchase contracts. This outline of DMA's thinking took shape in Administrator James Boyd's testimony before a House sub-committee on defense spending. Boyd asked the committee for funds to provide Government financing if necessary. However, the policy of the Defense Production Administration puts loans at the bottom of the list of ways to stimulate production. With purchase contracts and quick amortization at the top of the list, it is felt that private financing can be arranged in most cases.

The big nickel project under consideration is construction of a refinery by Falconbridge Nickel Co. DMA listed $65,000,000 for this purpose. A basic policy question is involved: Should the refinery be built in Norway or in North America? It would be cheaper in Norway, but strategically more secure either in Canada or the U.S. Low-grade nickel deposits in the West are down for $2,800,000, in case companies which have been doing development work put in requests for loans.

Somewhere between $65,000,000 and $98,000,000 might be required in loans for the Copper Range Co.'s project at White Pine, Mich. Dr. Boyd thinks the final figures might be close to the smaller of the two sums he mentioned.

Chromite development at Stillwater, Mont., is down for a $6,000,000 loan. DMA listed $250,000 for an Oregon beach sand project, and an additional $250,000 more which might be needed for purchase contracts.

DMA has almost 300 applications asking for $9,000,000 in loans for zinc mining. Of this sum, the agency expects to approve about $6,400,000, but only $2,400,000 up to June 30.

Iron ore projects are topped by $2,000,000 for developing Lone Star Steel Co. property at Daingerfield, Texas. There is an additional $1,000,000 listed for miscellaneous iron ore projects. No taconite project is on the DMA active project list at this time. Boyd said the companies involved had not submitted proposals.

Antimony is down for $400,000. A loan for a roaster to be installed at the Yellow Pine mine would come to $300,000. The rest is for several small projects.

The only fluorspar development which DMA thinks may need a government loan during the rest of this fiscal year is a mill planned for Brownsville, Texas. It listed the project for $1,500,000.

A manganese project at Philipsburg and Butte, Mont., is down for $800,000, and one at Batesville, Ark., for $2,000,000. In addition, DMA listed $500,000 for purchases to be made at depots in New Mexico, Texas, California and elsewhere. DMA also asked for $2,000,000 to make purchases abroad.

Tungsten loans scheduled for action this fiscal year include $2,000,000 for the Nevada-Massachusetts Co. and $400,000 for the Piute Co. Smaller projects totaling $200,000 are also in line pending decisions.

Beryl projects are not down for loans, but DMA asked $300,000 to make purchases from domestic producers, and $800,000 to make purchases abroad. Columbium-tantalum is listed for $100,000 to make domestic purchases. Mica may require $500,000 for foreign purchases.

Tungsten Producers Must Apply Before July 1 to Obtain Five-Year Guaranteed Price

Miners who want to sell tungsten to the Government at the $63 price—the 5-year guaranteed floor (E&MJ, April, p. 120)—must notify General Services Administration before July 1. Buying will begin July 1. Notification can be simple. Just write or telegraph something like this: "I want to join in the Government's program and will prospect for or produce tungsten." Sign name and address. Notification must be postmarked not later than June 30.

The guaranteed price applies only to: 1, Newly discovered or newly mined ores and 2, production above 1950 levels, with some exceptions to be approved by Jesse Larson, administrator of GSA. Purchases will be made up to a total of 1,468,750 units. The price of $63 will be based on a short ton unit, dry weight, of contained tungsten trioxide, F.O.B. carrier's conveyance, less penalties imposed.

Payment will be made to the producer upon delivery at specified receiving stations. Location of the stations will be announced well in advance of June 30, Larson said.

Here are the regional offices where producers can send their notification: 2000 Fidelity Building, 911 Walnut St., Kansas City, Mo., for Missouri, Iowa, Nebraska, North Dakota, South Dakota, Minnesota; 1114 Commerce St., Dallas 2, Texas, for Texas, Louisiana, Arkansas, Oklahoma; Building 1, Denver Federal Center, Denver, Colo., for Colorado, Wyoming, Utah, New Mexico; 630 Sansome St., San Francisco 11, Calif., For California, Arizona, Nevada, Hawaii; U.S. Courthouse, Seattle 4, Washington, for Washington, Oregon, Idaho, Montana, and Alaska.

Tungsten Ceiling Set Over OPS Opposition

The Government's price ceiling of $65 per short ton unit for tungsten concentrates was issued after a bitter dispute with a group inside the Office of Price Stabilization which favored a much lower price ceiling, plus the use of direct subsidies.

The decision was a defeat for the subsidy advocates, but it should not be interpreted as final. The question of subsidies has not been settled for good. It will crop up again as OPS moves along with its price-fixing job. Sam Ewing, chief of the OPS Minerals Branch, has said he would favor subsidies under some circumstances.

The tungsten argument began when Defense Mineral Administration came to OPS with a plan to put a $63 per ton floor under tungsten. Samuel Lipkowitz, economist for the Metal Branch of OPS, first suggested that $45 a ton would be sufficient, with subsidies to be used to stimulate production over that price. Lipkowitz later proposed $55 per ton. He opposed the $65 ceiling to the end, telling a Congressional committee on the day it was announced that it is a "fraud against the American people."

Lipkowitz argued that the ceiling price would guarantee large profits to the most efficient producers.

Mike DiSalle, director of OPS, gave the official view when he announced the ceiling: "Since much of the required tonnage may have to come from low-grade ores, the ceiling price has been established at a level to compensate for higher costs and investment."

Dr. James Boyd, Administrator of DMA, in arguing for the $65 ceiling, stressed its administrative simplicity.

Brief, but Important:

Copper Tariff—The Senate Finance Committee agreed to the House bill suspending the 2c. per lb. import tax on copper, with only one change. The House version provided for the suspension until Feb. 15, 1953. The Senate version added the phrase, "or at the end of the present national emergency, whichever is sooner." Both versions call for suspension of the tariff, providing the domestic price does not average below 24c. per lb., Connecticut Valley, for any one month. The bill has been passed by the Senate. Similar action is expected on lead and zinc.

Equipment Needs—Mines, mills, and smelters, domestic and foreign, henceforward will have to have a serial number to qualify for DMA assistance in filling equipment, operating supply and maintenance needs. Applicants should fill out Form MF-100, obtainable either from DMA in Washington or the regional offices of the Bureau of Mines.

Toll Agreements—In order to check unorthodox operations by zinc consumers struggling to assure themselves of supplies by purchasing ore or concentrates, DMA has prohibited delivery or acceptance of zinc ore and concentrates for processing on toll (meaning where shipper takes the metal back or where title does not pass to the processor). Applications for exceptions should be made to DMA, giving details.

Devaluation—The Emergency Lead Committee's fight to have the effect of currency devaluation considered in making trade agreements didn't get any encouragement from Winthrop G. Brown, trade policy chief for the State Department, in an appearance before the Senate Finance Committee. Senator E. D. Millikin of Colorado took very much the same position as the Emergency Lead Committee. Millikin maintained that by disregarding the impact of currency devaluation, the State Department was, in effect, scrapping the tariff rates worked out by negotiation.

The Senate Finance Committee has ended the hearings, which were on legislation to extend the Trade Agreements Act.

Freight Boost—Encouraged by an interim rate increase, which affects minerals and metals, railroads are going after additional increases which, if successful, would add 15% to freight bills.

The interim increase is 2% in the East, 4% in the West, and 2% on shipments between the two territories. The boost was granted by the Interstate Commerce Commission while it continues to study the railroads' already pending request for a flat 6% increase. The 15%, if granted, would include the 6%.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

FIRING A COMMUNIST: You can do it, for sure, if the union goes along. If not, you can do it in most cases if you can defend yourself against possible charges that the dismissal was for union activity. That seems to be the purport of two significant decisions:

1. NLRB refused to file unfair practice charges against an employer who, on union request, fired an employee who signed the Stockholm Peace Petition. NLRB accepted employer's position that the worker was undesirable, caused unrest in the plant. (Holeproof Hosiery Co., Milwaukee).

2. California Supreme Court upheld arbitration award requiring employer to reinstate a communist. Reason: Employer had known employee's communist activities for two years, but didn't dismiss her until she became active in union dispute with the company. (Cutter Laboratories, Berkeley, Cal.)

WATCHING COMMUNISTS: FBI's J. Edgar Hoover warns: Communists are infiltrating mines and factories engaged in vital defense efforts. They have a "hard core dedicated to sabotage and to militant revolt against this country if and when the time comes."

COMMUNIST THANKS: "March of Labor," a monthly peddling the Communist Party line among workers, is pleased to announce 2,000 new subscriptions among Mine, Mill and Smelter Workers members. It thanks Mine-Mill's executive board for letting their editor attend staff conferences.

WAGES RISING: Look for a sixth-round of wage increases this summer. Wage controls won't stop an increase of 5 or 10 cents an hour. Mine-Mill asks for a 30-cent wage boost and $100 monthly pensions. It will settle for less, of course.

NEW WSB: Labor leaders scored a real coup in getting Truman to assign labor disputes functions to the reorganized Wage Stabilization Board. They showed how they can use bigger voice in mobilization to get what they want over industry opposition. Advising Truman through the new Mobilization Advisory Board cuts into mobilizer Wilson's free hand.

WSB IMPACT: Immediate result of labor's victory will be relaxation of the 10%-over-Jan. 15, 1950, wage increase ceiling. Later, WSB will be used as a substitute for Taft-Hartley's 80-day injunction in national emergency disputes. Still later, organized labor will use WSB to win the union shop and other infringements on management rights.

DISPUTES SETTLEMENT: Unless both sides agree voluntarily, WSB will hear only those labor disputes certified by Truman as hurting national defense substantially. Recommendations, not decision, will be reported to the President. With the union, you can agree to let WSB decide a dispute or recommend settlement terms.

D.P. MINERS: Displaced Persons Commission has more than 125 experienced hardrock miners available for those employers who make the necessary assurances. If you deal through a religious or welfare agency, handling D.P.'s, you need only assure a job. Otherwise, you must also assure housing and keep the D.P. from becoming a public charge. For information write Displaced Persons Commission, Washington 25, D.C., or to one of the 33 state offices.

RESERVISTS: Chances of keeping them, barring big war, are good. Here is new Defense Department policy:

Army and Air Force—not calling any more inactive enlisted reservists. Inactive officer reserves will be called only when they have skills not available from organized reserves.

Navy—calling inactive reservists only when organized reserve units can't supply the men or necessary special skills.

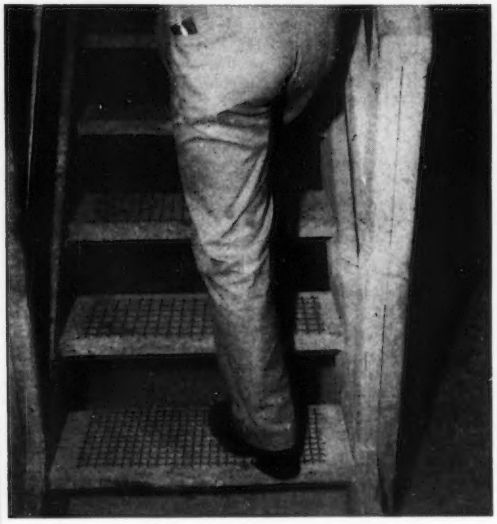
Marines—calling only those inactive reservists with specialties needed to fill specific billets.

All services—inactive reservists called to duty involuntarily are being released, beginning this summer.

DRAFT OUTLOOK: Draft age will be 18 or 18½ years. Service will be for 24 or 26 months. Universal military service and training will be put off.

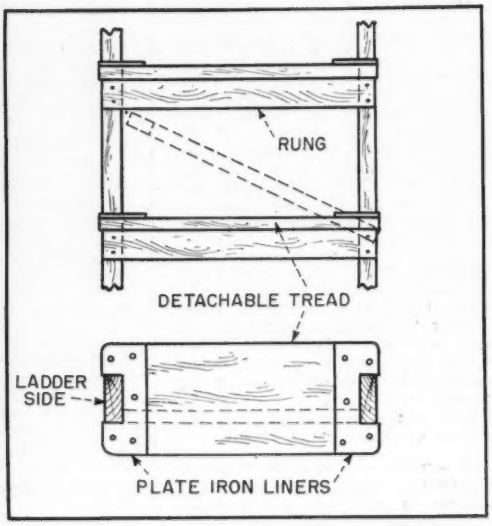
ESSENTIAL: Commerce Department's list of "essential activities" has been tightened, but "metal and non-metallic mining and milling" and "smelting, refining and processing of metal" are still on it. List is used by Defense Department in delaying call of reservists and national guardsmen, and by draft boards as "information" in considering deferments.

OPERATING IDEAS



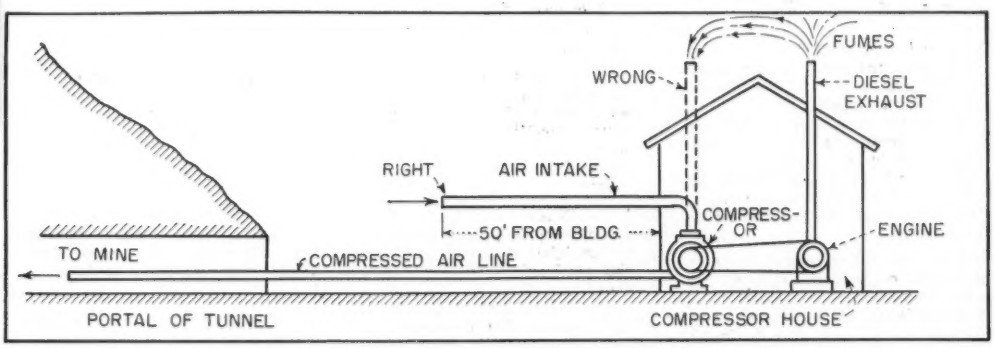
A Slip-Proof Stair Tread

If wooden stairs in mills have a tendency to become slippery due to an occasional collection of dust and moisture, the hazard can be corrected easily with materials usually available. As shown above stair treads of the Kerr-Addison mill, Ontario, Canada, are covered with sections of old wire screen. If dust accumulates on these treads, they can be hosed off readily. Covered in this manner, the treads are always slip-proof.



A Comfortable Ladder Rung

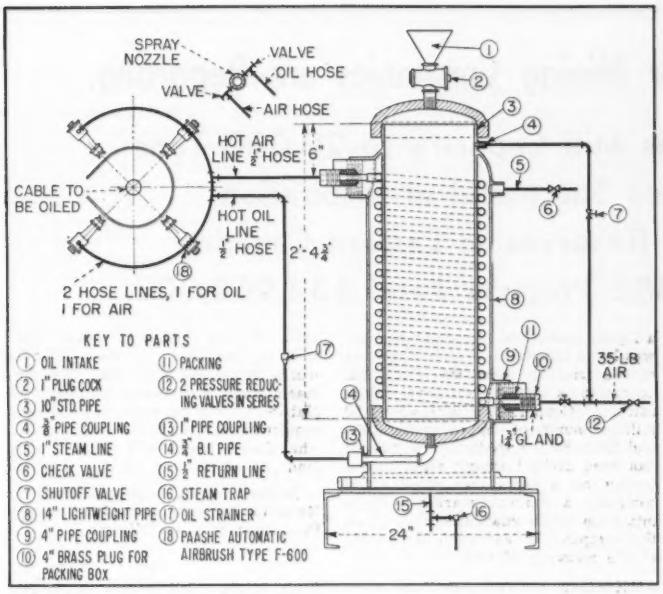
Standing on the narrow edge of a conventional ladder rung is hard on the in-step if you have to work in that position very long to hang pipe, cables, or other equipment in raises or shafts. For solid comfort, try making a detachable ladder rung like that shown above. It can be slipped over a conventional rung readily by canting it at an angle and then dropping it in place. Result: A nice flat comfortable tread on which to stand while working.

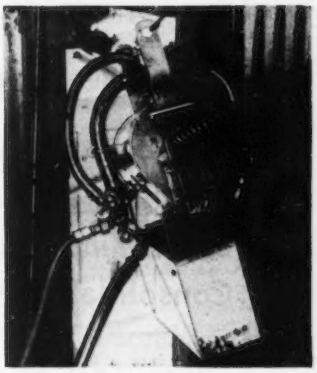


Compressor Intake Should Not Be Near Diesel Exhaust

Calvin H. Barkdull, mining engineer, Seattle, Wash., reports that in his field work he has been surprised to see a number of small operators, and some big ones, endanger the lives of underground workers by careless location of the compressor intake. As shown above, it is possible for deadly carbon monoxide fumes to drift from the exhaust pipe of a diesel engine into the intake of a compressor. The remedy is to place the compressor intake in some position where the diesel exhaust gases will not drift. Fifty feet from the compressor house is what Mr. Barkdull suggests as a safe minimum.

Device Lubricates Hoisting Ropes in Motion





This effective device for lubricating hoisting ropes while in motion has been developed by the mechanical department of the Homestake Mining Co., Lead, S. D., under the direction of Josiah Gerrans, chief mechanical engineer. Before lubrication, the rope is cleaned with compressed air. Then the lubricant is sprayed on by means of spray nozzles.

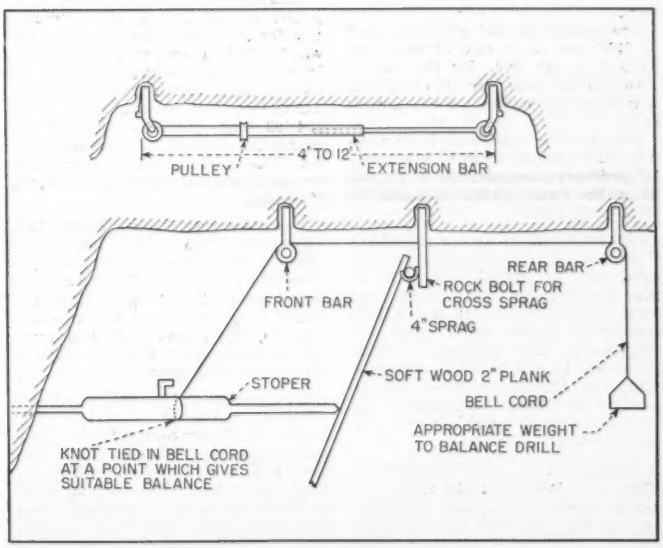
The lubricant and the compressed air for the spray guns are heated to about 170° F. in a steam heat exchanger. A light medium lubricant is used, except for 150 ft. of rope adjacent to the cage or skip where a heavier lubricant is used. With this equipment, two ropes can be lubricated in about 20 min. Ends near the cage or skip are not lubricated on the same day as the main rope. Sometimes these ends have to be cleaned with dry steam as well as compressed air. Each rope is completely lubricated every 10 days.

The piping diagram shows how the compressed air is heated in a coil in the heat exchanger; and the lubricant, by passing through a 10-in. pipe section within the heat exchanger jacket.

This idea has also been presented at the Conference on Wire Ropes in Mines held by the Institution of Mining and Metallurgy in England on Sept. 19-22, 1950.

A Stoper Set-Up for Drilling Flat Holes

Here is a stoper set-up that is gaining favor in several Canadian operations—in fact this system has resulted in faster drilling speeds than achieved with light air-feed leg machines in one mine where both drilling methods were tried. The stoper can be handled easily by one man, principally because of the counter-balance assembly shown. A 2-in. softwood plank provides footing for the air leg of the stoper, and can be shifted about readily. The top of the softwood plank rests against a cross-sprag which is chained to two hooks anchored in the back with steel wedges. Pulleys which support the bell cord are mounted on two telescopic cross-bars, also wedged to the back.



THIS MONTH

What The Major Mining Companies are Reporting:

- **Climax Increases Mill Capacity to 20,000 Tons**
- **Leaching in Place Successful at Inspiration**
- **Large Zinc Ore Reserves in Eastern Canada**
- **Consolidated M&S Projects Total $33,965,000**

CLIMAX MOLYBDENUM CO. Climax has entered into a 5-year contract with the Government starting Jan. 1, 1951 to take every step possible to expand production of molybdenum products. This contract requires the company to maintain capacity output the present working levels, and to proceed as rapidly as possible to mine ore reserves from the recently opened Storke level, some 300 ft. below the present operating levels. The capacity of the primary mill will be increased by 5,000 tons per day to treat 20,000 tons per day. The capacity of the by-products plant will be increased by about 2½ times. Output from this plant in 1950 was 162,000 lb. tungsten contained in concentrates. Other by-products recovered were pyrite, tin concentrate, monazite, and topaz. Cost of capital improvements to maintain this stepped-up production rate will be about $10 million, the major part of which should be completed by January 1953. Additional expenditures will have to made for development work.

Ore production during the first half of 1950 was at a rate of less than 5,000 tons per day. By the end of 1950 this rate was increased to 15,000 tons of ore per day on a 6-day a week basis.

Stocks of molybdenum in concentrate and product form in the hands of producers dropped from 29,956,000 lb. at the close of 1949 to 5,584,700 lb. at Dec. 31, 1950.

Climax Uranium Co., a subsidiary of Climax Molybdenum Co., has entered into a contract with AEC to mine uranium ores from its own lands on the Colorado Plateau and certain government lands under lease arrangements. All uranium concentrates will be sold to AEC, and vanadium concentrates produced will be acquired by Climax Molybdenum Co. for processing at Langeloth and subsequent sale.

CONSOLIDATED COPPERMINES CORP. The Morris Brooks mine containing several million tons of potential ore was reopened in 1950 after a 1-year shut-down. A 2-year contract was let to handle some 15 million tons of material to open the pit. This operation is expected to supply Consolidated Coppermines with about 50 million pounds of copper during 1951 and 1952. Entire production of the pit has been divided among regular customers on a basis that assures the company a current market with a minimum price guarantee that gives the company a reasonable assurance of the recovery of cost.

AMERICAN METAL CO. Total sales by the company in U. S. A and abroad for 1950 were:

Copper	426,734 short tons
Lead	226,578 short tons
Zinc	167,186 short tons
Tin	10,133 long tons
Silver	65,233,718 oz.

Mufulira Copper Mines, Ltd. (American Metal Co.'s interest in this company is 32.43%) Production for the year ended June 30, 1950 was 77,048 long tons of blister copper. Production for the July-Dec. 1950 period was 42,618 long tons. Production for the year ended June 30, 1949 was 70,966 long tons of blister copper. Increase in production was due to mining of a record tonnage of ore during the 1949-50 year, namely 3,134,493 tons. Block caving now accounts for 56% of the tonnage hoisted. The new electrolytic refinery is expected to start operation in April, 1952.

Roan Antelope Copper Mines, Ltd. (American Metals Co.'s interest in 32.65%). Production of blister copper increased here also. For fiscal year ended June 30, 1949 production was 56,162 long tons; for the year ended June 30, 1950 it was 63,557 long tons; for the half ended Dec. 31, 1950, it was 36,348 long tons.

O'okiep Copper Co., Ltd. (American Metal Co.'s interest is 19.72%) Production of blister copper for the year ended June 30, 1950, was 22,303 long tons, and for the half ended Dec. 31, 1950, 11,060 tons. The leaching plant at Nababeep to treat oxidized dump ores went into production in Dec. 1950. A new 3,000-kw. steam plant will be installed in East O'okiep which together with the 1,500-kw. steam plant now being completed at Nababeep, will produce major power requirements with South African coal. The diesel plant will handle peak loads an emergency loads.

Tsumeb Corp., Ltd. (American Metal Co.'s direct interest in 28.50%) Production was as follows:

Refined Metals	6 mos. ended Dec. 31, 1950	Fiscal Year ended June 30, 1950
Copper (short tons)	5,320	8,484
Lead (short tons)	15,029	32,320
Zinc (short tons)..	6,488	9,320
Cadmium (lb.)....	288,674	415,924
Silver (oz.).....	315,134	525,481
Tonnage ore milled		317,095

A 2,500-kw. steam turbine plant was installed in 1950, and additional plant capacity of 3,000 kw. has been ordered. This will permit the use of South African coal and decrease dependence on oil purchased from foreign sources.

Southwest Potash Corp. American Metal Co. entered the potash field in 1950 through this wholly-owned subsidiary to develop a large potash deposit near Carlsbad, N. M. The property is located mainly on Government property leased to Southwest Potash Corp. By the end of 1950 design and engineering work on the mine and the plant were well advanced, two circular shaft 20 and 15 ft. in diameter were being sunk, and construction of surface installations including power lines, railroad, and a 24-mile water pipe line had been started. Production should begin in late 1952.

Mine and mill will handle 2,500 tons of ore per day, which will be treated by flotation to produce standard muriate of potash (minimum 60% K_2O).

TENNESSEE CORP. Conversations have been held by company officials with members of the AEC with a view toward the possible recovery of uranium in the process of manufacturing triple superphosphate. The

company has a triple superphosphate plant near East Tampa, Fla.

An additional tract of phosphate land, adjoining deposits owned by the corporation in Florida was purchased in 1950 to assure future reserves.

The corporation has continued operation of the sulphuric acid plant at the Alabama Ordinance Works under Government lease. The sulphur shortage may reduce output of this plant this year. Output of sulphuric acid from the Tennessee Copperhill plant and the Alabama plant has not been enough to satisfy all customer demands.

INSPIRATION CONSOLIDATED COPPER CO. Copper production for 1950 was as follows:

	Pounds fine copper
From ores	
Electrolytic copper	58,892,007
Blister copper	13,811,484
Total equivalent to 17.75 lb. per ton treated	72,703,491
From leaching in place	4,178,194
Total copper produced	76,881,685

Sulphuric acid production from combined facilities was 75,358.7 tons of 60° Be' acid, all for use in leaching.

Ore production from the operations was as follows:

	Tons	% total copper	% oxide copper	% sulphide copper
Underground	2,114,423	1.008	0.270	0.738
Open Pit	1,898,666	1.076	0.848	0.228
	4,013,089	1.041	0.545	0.495

Open-pit mining included the removal of 4,228,273 tons of waste, making a waste-to-ore ratio of 2.22 to 1.

Leaching in place operations began in April 1950. Results have been satisfactory. Yield for the period by this method was 4,178,194 lb. copper.

Of the 4,023,923 dry tons of ore received from the mines during 1950, 268,561 tons of slimes or fine ore particles were removed and treated separately. The remaining 3,755,362 tons of ore, bedded in leaching tanks for acid ferric sulphate leaching, averaged 1.008% total copper of which 0.505% was oxide, and 0.503% was sulphide. Power consumption per pound of copper deposited electrolytically was 1.298 kwh (a.c.)

Slimes removed from the ore to improved percolation in leaching were treated by flotation to recover sulphide content. Oxide-bearing tailings were leached with sulphuric acid. Slimes treated by this method assayed 1.487% total copper, of which 1.093% was oxide, and 0.394%, sulphide copper.

HUDSON BAY MINING & SMELTING CO., LTD. Ore mined during 1950 totaled 1,854,755 tons averaging 0.083 oz. gold, 1.34 oz. silver, 2.24% copper, and 4.6% zinc. Direct smelting ore treated from stockpile was 16,051 tons. The foregoing tonnage and 41,496 tons of purchased concentrates yielded 84,833,875 lb. copper, 97,887,266 lb. zinc, 130,041 oz. gold, and 1,947,318 oz. silver.

The fuming plant, started in 1948, will be in full operation soon. This plant will treat about 109,500 tons of plant residue, of which 51,000 tons will come from annual production, and 58,500 tons from stockpile. As of Dec. 31, 1950, the zinc plant residue stockpile totaled 889,000 tons averaging 0.149 oz. gold, 3.98 oz. silver, 1.07% copper, and 26.49% zinc.

The cadmium plant treated precipitates from the zinc purification plant producing 141,456 lb. metallic cadmium.

DOME EXPLORATION (CANADA) LTD. Diamond drilling totaling 4,946 ft. at the Bachelor Lake property indicated 240,000 tons of possible ore grading 13.95% zinc, 0.77% lead, and 6.46 oz. silver above the 500-ft. horizon. One deep hole drilled to cut the ore at 700 ft. showed a grade of 16.55% zinc, 1.41% lead, and 5.05 oz. silver over an 8.7-ft. width. An additional 5,000 ft. of drilling will be necessary for complete information.

Dome exploration also undertook to bring the old Stirling zinc, lead, copper property in Nova Scotia into production, now called the **Mindamar Metals Corp. Ltd.** Dome Exploration will advance up to $1,750,000 to bring the property into production at a rate of 500 tons per day. Positive and probable ore reserves total 780,000 tons averaging 8% zinc, 1.8% lead, 0.9% copper, 2.0 oz. silver, and 0.03 oz. gold. An effort will be made to bring the mine into production by the end of 1951.

NORANDA MINES, Ltd. The Horne Mine shipped 1,349,369 tons of ore to the smelter and concentrator, consisting of 579,437 tons of direct-smelting ore assaying 2.09% copper, 0.187 oz. gold, 0.42 oz. silver; and 769,932 tons of concentrating ore assaying 2.09% copper, 0.139 oz. gold, and 0.32 oz. silver. Smelter figures for the year were:

Ores, concentrates, etc. treated	1,243,700 tons
Anodes produced	153,042,178 lb.
Material treated for other companies	529,103 tons
Estimated recovery copper	145,373,197 lb
Estimated recovery gold	377,952 oz.
Estimated recovery silver	2,356,105 oz.

Estimated recovery from Horne mine:

Copper	51,462,222 lb.
Gold	202,543 oz.
Silver	572,080 oz.

Ore reserves of the Horne mine above the 2,975-ft. level as of Jan. 1, 1951 were 4,031,000 tons averaging 7.05% copper and 0.157 oz. gold per ton; and 12,559,000 tons averaging 0.68% copper and 0.195 oz. gold per ton, or a total of 16,590,000 tons averaging 2.22% copper and 0.186 oz. gold.

The Gaspe Project. Drilling in the Gaspe project in 1950 has revealed 10 million additional tons of ore. Reserves in Copper Mountain and in the upper zones in Needle Mountain average somewhat less than 1.0%, but 20 million tons in the lower Needle Mountain zone average 2.0%. Total tonnage in the Gaspe copper properties is now estimated at 57 million tons.

QUEMONT MINING CORP., LTD. Total production from June, 1949 to Dec. 31, 1951 was:

Ore milled	1,105,677 tons
Copper in concentrates	34,553,583 lb.
Zinc in concentrate	18,817,088 lb.
Gold produced for sale	151,355 oz.
Silver produced for sale	567,980 oz.
Pyrite concentrates shipped	106,081 tons

Ore reserves as of Jan. 1951 were 9,402,000 tons averaging 0.167 oz. gold, 0.95 oz. silver, 1.43% copper, 2.87% zinc.

NORMETAL MINING CORP., LTD. Production for 1950 was as follows: 363,297 tons milled averaging 2.45% copper, 8.08% zinc, 0.031 oz. gold, 2.72 oz. silver. Payable metals were 15,706,299 lb. copper, 5,118 oz. gold, 491,798 oz. silver, 48,054,818 lb. zinc. Copper concentrates were smelted at Noranda; 58% of the zinc concentrates were shipped to the U. S., and the balance to Belgium.

Ore reserves estimated before allowance for dilution as of Jan. 1, 1951 were: 1,573,100 tons averaging 3.32% copper and 7.59% zinc. In addition there are about 401,700 tons of 11.62% zinc in the No. 3 shaft area, and 36,900 tons of 9.34% zinc in the No. 2 shaft area.

MIAMI COPPER CO. Production of copper for 1950 totaled 46,553,778 lb. of which 44,330,952 lb. came from 4,003,306 tons of ore averaging 0.667%; 1,857,704 lb. from 546,113 tons of copper solution assaying

Company Reports *(Continued)*

0.185%; and 365,122 lb. from 1,369 tons of Burch precipitates assaying 13.931%. Molybdenum recovered from retreatment of copper sulphide concentrates was 627,288 lb.

Ore reserves as of Jan. 1, 1951 were estimated to be 18,609,263 tons of sulphide ore. It is estimated that these reserves will result in mining of about 16 million tons assaying 0.78% copper.

Castle Dome Copper Co., Inc. Ore mined totaled 3,690,465 tons assaying 0.704% copper, yielding 44,795,706 lb. copper in 1950. Waste removed totaled 855,419 tons. Ore reserves of Castle Dome and Red Hill as of Jan. 1, 1951, were estimated to be 10,032,618 tons averaging 0.665% copper. Included is a block of low-grade material reported as lying between the 4,040 and 4,085-ft. levels of the Castle Dome section. This material has attained the status of ore due to prevailing favorable market conditions and was partially mined during 1950.

Copper Cities Mining Co. Preparatory work on the open-pit operation consisting largely of road construction was started here in 1950. It is planned to uncover the ore and prepare building sites at Copper Cities Mining Co. for the plant of Castle Dome Copper Co., Inc., which will be moved after the exhaustion of that orebody.

ANACONDA. Total production of metals for 1950 (in metallic form) from company mines, toll, and purchased materials was

Copper	914,138,946 lb.
Zinc	432,206,673 lb.
Lead	124,379,266 lb.
Silver	7,484,143 oz.
Gold	125,268 oz.
Manganese, assaying 58.91%	101,765 long tons
Ferromanganese	30,763 long tons
Arsenic	4,636 short tons
Cadmium	1,917,289 lb.
Treble superphosphate and phosphoric acid	105,133 tons

Greater Butte Project. The pilot excavation of the Kelley shaft has reached a depth of 1,361 ft. and the shaft enlargement to full size with concrete lining is 599 ft. below surface. Construction of the main hoist house including installation of a 7,500-ton steel ore bin was completed in 1950. A 3,000-hp. main hoist is now ready for operation, and a second 2,250-hp. will be completed in 1951. Work on the 600 and 1300 main haulage levels now under way should permit low-grade ore extraction by 1952. Production should reach 6,000 tons per day in 1952, 10,000 tons per day in 1953, and eventually 15,000 tons per day. These production rates should yield 40, 60, and 90 million lb. of copper annually in addition to production from higher grade sources. Remodeling of two sections of the concentrator has been completed, and the two remaining units will be completed in 1951.

Zinc concentrator capacity was increased from 2,000 tons of zinc ore to 4,000 tons per day. Expenditures for construction at Butte, Anaconda, and Great Falls totaled $4,447,446 in 1950.

Chile Exploration Co. Expenditures for construction for 1950 were: $21,803,984 for the sulphide plant and $688,737 for the oxide plant. The first unit of the new sulphide plant should be ready for operations in Dec., 1951. The plant which will consist of a sulphide concentrator and a smelter should be in full operation by the end of 1952. Concentrator capacity will be 30,000 tons per day. Each section consists of one 10x14-ft. rod mill, one 10x12-ft. ball mill with classifiers and 58 flotation cells. The smelter will contain three reverberatory furnaces each 35x125 ft. and three 13x30-ft. Peirce-Smith converters. Output of the sulphide plant will be 300 million lb. blister copper per year. Total estimated cost of the new sulphide plant is about $90 million. Expenditures through Dec. 31, 1950, were $44.8 million.

CONSOLIDATED MINING & SMELTING CO. OF CANADA, LTD. Production for 1950 was as follows:

Lead	170,364 tons
Zinc	156,021 tons
Silver	12,120,568 oz.

Ore mined at the Sullivan mine in 1950 was 2,680,962 tons. The mining of more pillar ore and greater tonnages of low-grade ore was continued in 1950. Plans were completed for open-cut mining of a section of the orebody close to the surface. The inclined mine conveyor system was extended to the 2,850 level.

Good progress was made in the designing of the new smelter, and construction of the baghouse and blast furnace was well advanced by the end of 1950. Construction of the sintering plant will start in mid-1951.

Plans for a 66-ton extension of the electrolytic zinc plant were completed. Construction should be completed early in 1952.

Tonnage of fertilizer produced was 542,636 in 1950. It has been decided to build a fertilizer plant adjacent to the Sullivan mill at Kimberley, B.C., to produce 70,000 tons of ammonium sulphate per year. Iron sulphide tailings from the mill will be the main source of sulphuric acid. Ammonia will be shipped from Calgary, and phosphate rock from Montana. The plant will cost $9 million and is expected to be completed in 1952.

Power consumption at the Trail plants in 1950 was about 1.75 billion kwh. Average loads were 199,276 kw. in 1950.

Major projects in progress are:

Modernization of Trail smelter	$12,000,000
Phosphate fertilizer plant	9,000,000
Zinc plant enlargement	3,200,000
Power transmission line	2,850,000
Bluebell Mine, Kootnay Lake	3,000,000
H. B. mine, Salmo, B. C.	2,750,000
Big Bull and Tulsequah Chief Mines, B. C.	1,165,000
Total of above projects	$33,965,000

Don't Miss
E&MJ's Special Issue
"Production for Defense"
July, 1951

Watch Molybdenum Metal!

From "The Influence of Materials on Future Design" a paper by L. R. Hill, assistant manager, Materials Engineering Dept., Westinghouse Electric Corp.:

"Titanium and molybdenum are two other materials about which you will hear much in the future. . . . Molybdenum is of interest since we have just recently been able to fabricate large sheets of this material and to use it for commercial applications. Its properties are similar to those of tungsten, but its density is less and its cost is much lower."

From "Trends in Newer Metals", a paper by Alex Stewart, Director of Research, National Lead Co.:

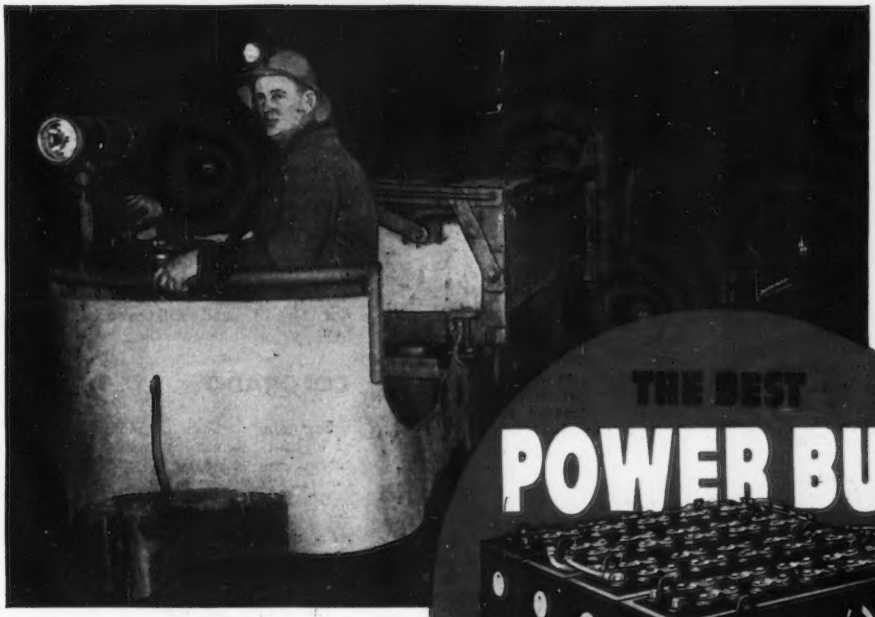
"Successful vacuum melting to produce a ductile material of molybdenum has been developed. This method promises to be competitive with the present powder metallurgy techniques, still the mainstay of our supply. One of the most striking physical properties of molybdenum is its high modulus of elasticity—42,000,000 psi. This value is exceeded only by tungsten. Short time high temperature tests indicate an ultimate tensile strength at 1690 deg. F. of about 94,000 psi. Molybdenum has one disadvantage for high temperature uses in that it forms a volatile oxide at about 750 deg. F. In this connection suitable cladding materials for protecting molybdenum are being developed. Zirconium type coatings are of greatest interest in this respect."

From the 1950 annual report of Climax Molybdenum Co.:

"Metallic Molybdenum and Its Alloys—Our annual report of 1949 referred to the large amount of research being conducted at that time on this subject. The interest in metals which can maintain useful properties at high temperatures continues unabated. Since there is promise that molybdenum and its alloys will meet requirements for service at higher temperatures than at present thought feasible, our research work is being intensified. We are also continuing to operate under research contracts with services of the Department of Defense."

From "In Metallurgy, the Accent Is on New Metals, New Methods," by A. W. Schlechten and H. R. Hanley, Department of Metallurgy, Missouri School of Mines and Metallurgy, E&MJ, Feb., 1951.:

"Several companies can now deliver sintered molybdenum ingots up to 4 in. square and 4 ft. long weighing 400 lb. Climax Molybdenum can melt in their special arc furnace billets up to 6 in. in diameter weighing 190 lb.; they expect to produce 9-in. diameter ingots weighing as much as 1,000 lb."



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IN THE UNITED STATES

- Alaska Offers Uranium Bonus . . P. 112
- Sunshine Sinks to 4,000 Ft. . . . P. 128
- New Uranium Refinery for Ohio P. 134

ALASKA

★**U. S. Smelting, Refining & Mining Co.** will operate five dredges this season and thawing and stripping operations will be on much the same scale as last year. J. D. Crawford announced that preparatory work for dredge No. 10 was scheduled to begin March 10, and for dredge No. 2 on Fairbanks Creek, March 13. Operations were to begin early in April. Three dredges are scheduled to begin operating at Nome late in May.

★**Consolidated Mining & Smelting Co. of Canada, Ltd.,** has leased the plant of Polaris-Taku Mining Co. on the Tulsequah River east of Juneau. The lease is to run for at least five years. About 200 men will handle 250 tons daily from the Big Bull and Tulsequah Chief mines. The product will be copper, lead and zinc concentrate, the copper going to the Tacoma smelter, and the lead and zinc to Trail, B.C.

★The Alaska Legislature has given its approval to the awarding of a **special $10,000 bonus for the discovery of radioactive minerals** in the Territory. The bonus is in addition to the recently increased AEC award and will be made under the same terms as the latter.

The special Alaska prize is expected to result in increasing the intensity of the search for uranium, as well as attracting more prospectors to the Territory. It is more than likely that the search will not be in vain as three areas of radioactivity in Alaska were reported during 1950. Prospects of Alaska becoming an important producer of radioactive minerals are good.

ARIZONA

★Outspoken Arizona Mining operators bitterly complained during hearings at Phoenix **that Government red tape has snarled efforts to get small mines into operation** to stockpile strategic materials.

Rep. Walter S. Baring, Nevada, met with members of the Arizona Small Miners Association and was told "the government 'grubstake' program for miners has done nothing for the small operator."

Charles F. Willis, secretary of the Arizona mine association, charged "we like a return to the free enterprise system, but the tax situation and regulations of the Securities Exchange Commission make it necessary for the miner to have his hand out to the government for help. We ask to be treated half as well as foreign countries."

Willis was sharply critical of U. S. action in spending money for mine exploitation abroad while shunning domestic mines.

Charles H. Dunning, director of the Arizona Department of Mineral Resources, said many of Arizona's 200 small mines need developing or the properties will be stripped. He recommended reactivation of the mines by a guaranteed price.

Baring, with Sen. James E. Murray of Montana, is sponsoring legislation in Congress to provide an automatic over-the-market incentive payment for strategic minerals, and a liberal exploration program.

CALIFORNIA

★**Idaho Maryland Mines Corp.** reported to stockholders in March that there is a possibility of scheelite production as a by-product from gold ore in the near future. Gold recovery has doubled since last October when mine management was changed, and an operating profit of $80,000 was reported for the first four months under changed management. A crosscut is being driven from the bottom of the Brunswick mine shaft at 3,200-ft. level. During 1950, 193,357 tons of ore were treated resulting in recovery of 51,697 oz. gold and 13,298 oz. silver.

★**Fairview Placers** is dredging about 7,000 cu. yd. of gravel per day since production started last September near Lewiston, Trinity County. Gold recovery is reported to vary from 800 to 1,000 oz. a month. The deposit is about 25 ft. deep on a schist bedrock. The firm's dredger was purchased from Junction City Mining Co. Equipped with 9-cu. ft. buckets, the dredger's old riffles were replaced with modern jigs.

★**Extensive deposits of expansible-grade perlite** were recently discovered along Green Creek about 5 mi. north of Cordelia in Solano County. The deposits appear to contain large tonnages of perlite suitable for making lightweight aggregate materials.

★**Beach sands along the California coast contain uranoan thorite** which consists of 7% uranium oxide, according to Dr. Colin O. Hutton of Stanford University who made a report at a Geological Society of America meeting in Los Angeles in March.

Hutton who has checked an area roughly from San Francisco to Monterey says the discovery is significant because the U. S. is turning to low-grade sources of uranium. He says the yield on uranoan thorite is about 4 parts in 10,000 or in other words, one ton of sand will produce one pound of uranoan thorite.

COLORADO

★Beginning in June, a mobile force of eight U. S. Public Health Service researchers will take the field in the Colorado Plateau to study **possible health hazards encountered in uranium mining operations** of Colorado, Arizona, Utah and New Mexico. Similar field work was carried out last summer at Durango, Naturita and Uravan, Colo., and Monticello, Utah.

The studies, on which a complete report will not be available until late 1952 or early in 1953, began a year ago, spurred by information that uranium miners in Czechoslovakia and Eastern Germany have suffered severely from uncontrolled exposure to ionization radiation and the effects of radon gas, with some statistics indicating a lung cancer mortality of 44% in mines and mills behind the Iron Curtain.

U.S.P.H.S. officials at the Salt Lake City field station note that uranium miners in the western states work in ores of low uranium content, and that there is thus little reason to believe this nation's underground workers are endangered to a degree in any way approximating that existing in European fields. No American miners have as yet been found to show signs of illness resulting from high exposure.

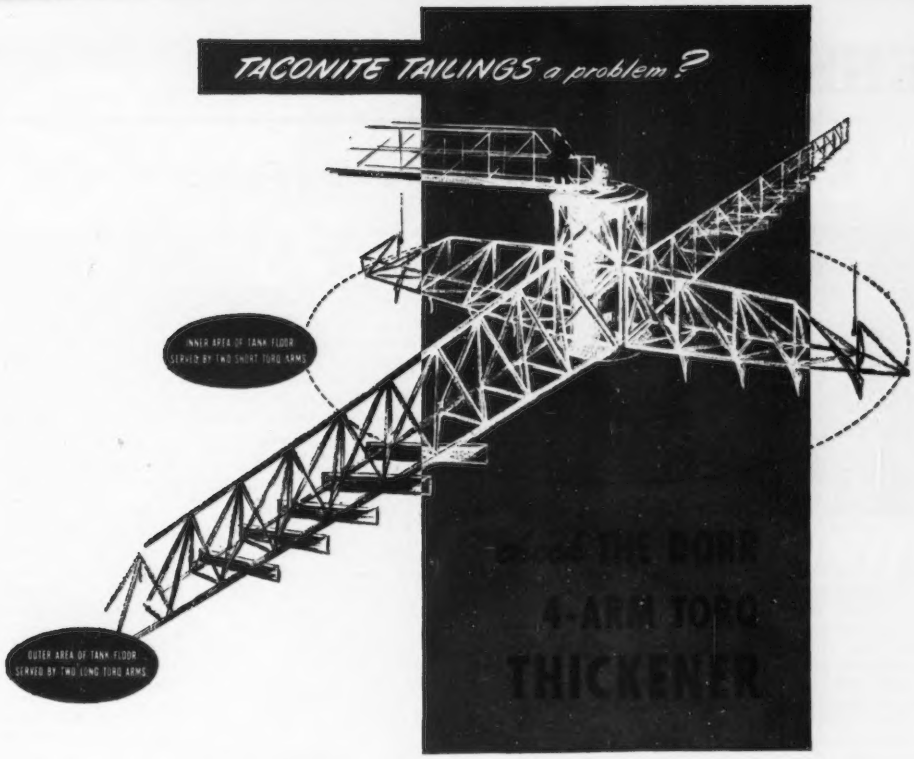
The current research is being carried out with the full cooperation of such major operators as the U. S. Vanadium Corp. and the Vanadium Corporation of America, as well as the Utah and Colorado State Health Departments.

In the course of field work, air samples will be taken at the face and elsewhere in several hundred mines, with the U.S.P.H.S. seeking "a 100% sampling" of the men and environments involved. X-rays of some 700 mill workers and controls were taken last year, and at least an equal number of underground miners will have their health and working conditions thoroughly checked during this season's field work.

At the University of Utah Field Station, such equipment as refracto-

(*Continued on page* 127)

TACONITE TAILINGS a problem?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PERSONAL NEWS

E & M J Salute for Outstanding Service

WALTER G. PATTON
General Traffic Manager
St. Joseph Lead Co.

NEARLY EVERY MINE OPERATOR, small or large, knows that freight costs for shipping concentrates and metal cut deeply into the price which he ultimately receives for his product. But many operators are not aware of, nor do they fully appreciate the efforts of a certain group of men in the mining industry—the traffic managers—who work unceasingly to keep freight costs as low as possible. All shippers benefit directly or indirectly from these efforts. That is why E&MJ presents this salute to Walter G. Patton, general traffic manager for St. Joseph Lead Co., for outstanding service to the mining industry.

One reason why Mr. Patton has been so successful in traffic work is because he knows railroading from two sides—from the side of the railroad operator and from the side of the large shipper. (St. Joe, largest lead mining company in the U. S., also ships huge tonnages of slab zinc, zinc oxide, and sulphuric acid.) He has had more than 20 years of railroading service in the operating departments of the MKT, AT&SF, Chicago & Alton, and Missouri-Illinois railroads as telegrapher, train dispatcher, chief dispatcher, division superintendent, assistant to the vice president and general manager, and since 1932 has been the general traffic manager of St. Joseph Lead Co.

Since 1932 he has been a director and is now a vice president of the Missouri-Illinois Railroad Co., operating 172 miles in Illinois and Missouri and serving St. Joseph Lead Co.'s plants in Southeast Missouri.

He has served continuously on traffic committees for the lead and zinc industries, and from 1944 to 1949 was chairman of the General Traffic Committee of the American Zinc Institute, representing practically all of the zinc mines, mills and smelters in the United States. The following example will show how Mr. Patton's activities on traffic committees has saved money for the shipper of ore and concentrates:

In I.C.C. Ex Parte 162, increase in freight rates effective Jan. 1, 1947, the non-ferrous industry took no active part, feeling that the railroads were entitled to a substantial increase in freight rate to provide efficient services. However, some competing industries did not take that position and the Commission's decision authorized a lesser increase for bauxite ore, aluminum concentrates, iron ore, aluminum, and iron and steel than for lead, zinc and copper concentrates and metals.

In I.C.C. Ex Parte 166, increased freight rates effective in 1948, the industry decided to challenge this preferential treatment of competing materials. Mr. Patton, as chairman of the General Traffic Committee of the American Zinc Institute and a member of the lead traffic committee, made a determined fight before the Commission and won a maximum increase of 1.5c. per 100 lb. for zinc and lead concentrates, the same as for iron ore, bauxite and aluminum concentrates, and a maximum of 16c. per 100 lb. for lead, zinc and copper, the same as for aluminum and iron and steel articles, in lieu of the 20% increase authorized generally in the West, 25% in the South and 30% in the East. The saving to the industry on concentrates was enormous and also continuing, since subsequent percentage increases were imposed on the lower base. An illustration of the savings in Ex Parte 166 is shown below:

Rates in effect Jan. 1, 1947			20% increase in West would have advanced rate to			30% increase in East would have advanced rate to			Actual increased rate effective May 6, 1948		
$ 4 00	Net	Ton	$ 4.80	Net	Ton	$ 5.20	Net	Ton	$ 4 30	Net	Ton
6.00	"	"	7.20	"	"	7.80	"	"	6.30	"	"
8.00	"	"	9.60	"	"	10.40	"	"	8.30	"	"
10.00	"	"	12.00	"	"	13.00	"	"	10.30	"	"

The saving to the miners on metals was also important since the miner not only pays the freight on the concentrates, but also on the metals to the markets. From the Far West the maximum of 16c. per 100 lb. held down the increase to all points east of Chicago.

The American Zinc Institute unanimously adopted a resolution expressing the appreciation of the zinc industry to Mr. Patton and his committee for their effective work and the gratifying results.

In I.C.C. Ex Parte 168, effective in 1949, Mr. Patton was again the witness for the zinc industry and succeeded in securing a decision which held the increase on zinc, lead and copper concentrates to the same percentage as was authorzied on bauxite ore, and aluminum concentrates, and also to the same increase on zinc, lead and copper metals as was authorized for iron, steel and aluminum.

As a member of a non-ferrous metals traffic group, headed by O. W. Tuckwood of the American Smelting & Refining Co., Mr. Patton cooperated in obtaining from the railroads amendments to existing tariffs publishing freight rates in the West that are based on valuation. The amendments provide for a fixed value for freight rate purposes (but not for liability in the event of loss or damage) of 7c. for lead, 8c. for zinc and 14c. per lb. for copper, regardless of the actual market value. Now that lead is 17c., zinc 17.5c. and copper 24.5c. per lb. the lower values used in assessing freight charges are very important to the Western miners.

Mr. Patton has always been willing to advise the small miner whose business does not justify the employment of a traffic manager and often is able to obtain commodity rates, especially on new movements, that reduce the miners' transportation costs. Only recently he showed a small miner in the Midwest where a substantial saving could be made by inserting the rate and the authorized routing in his bills of lading instead of leaving it to the trainmen and yard crews to forward the traffic as they saw fit.

Mr. Patton feels that small shippers should have all of their inbound and outbound freight bills audited, as do large shippers, especially since present-day tariffs are so technical and complicated. There are numerous commercial traffic agencies that will audit such bills for a fee of 50% of any overcharges collected, making no charge unless overcharges are discovered.

His favorite recreation, aside from deep-sea fishing and golf, is trout fishing in Canada and the Rocky Mountain streams and luckily he is blessed with a wife who likes nothing better than to accompany him into the wilds and catch a fish that tops his on the scales.

(Personal News Continued on p. 118)

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The H-22 Hornet is a terrific little rock drill. It weighs only 18 lbs., but it has all the design features found in larger Le Roi-CLEVELAND machines. That is why, pound for pound, you can't beat it for drilling speed.

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PIPE COUPLINGS AND FITTINGS

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J. ROBERT VAN PELT, mining engineer and reserach executive, has been named president of the Montana School of Mines to succeed the late Dr. Francis Thomson. Dean Arthur Adami, acting president since Oct. 1, 1950, has resumed his regular duties.

W. Church Holmes, formerly with Nichols Engineering & Research Co. of New York, is now on the staff of The Fluor Corp., Ltd., of Los Angeles, Calif. He is now living in Duarte, near Los Angeles.

William D. Lord, Jr., has been appointed general manager of mines of the International Mining Co., controlled by W. R. Grace & Co., of New York, with operations in Bolivia. He had served as acting manager since December, 1950, and succeeds **George D. Bellows**, who resigned to return to the United States.

K. B. Gillaspie has been transferred from the staff of the Midvale, Utah mill of the U. S. Smelting, Refining & Mining Co. to the position of assistant mill superintendent at the Bullfrog mill at Bayard, New Mex.

K. D. McBean, of the metallurgical division of the Consolidated Mining & Smelting Company of Canada, Ltd., is spending some time on a business trip to England and France. He will act as metallurgical consultant on suspension roasting to the Societe Miniere et Metallurgique de Penarroya and St. Gobain Chemical and Metallurgical works.

The following directors were elected at the annual meeting of the stockholders of the Beryllium Corporation held in March: **Matthew J. Donachie, Otto T. Englehart, Maurice A. Hallam, Richard M. Quimby** and **Daniel D. Schwartz**. At the reorganization meeting of the board of directors the following officers were elected: **Daniel D. Schwartz**, chairman; **Otto T. Englehart**, president and acting treasurer; **Matthew J. Donachie**, vice president; and **Richard M. Quimby**, secretary. **Frank A. Else** has been appointed comptroller of the company.

A. H. Barrios has been transferred as a mine foreman to the Andes Cop-

per Mining Co., Poterillos, Chile, from Anaconda Copper Mining Co.'s mines at Butte, Mont.

George C. McMullen, vice president, Tyson Bearing Corp., retired April 1, after nearly 19 years' service with the company.

Francis A. Hancock, consulting engineer of Missoula, Mont., has moved to Challis, Idaho, where he will serve as general superintendent in charge of milling at a fluorspar property being put into operation by the J. R. Simplot Co. at Meyers, Idaho.

Elliott F. Dressner, formerly project geologist, Colorado Exploration Branch, U. S. Atomic Energy Commission, Grand Junction, Colo., is now staff geologist of the phosphate division of International Minerals & Chemical Corp., Mulberry, Fla.

R. N. Bateman, mechanical engineer, has been transferred from Oliver Iron Mining Co., Duluth, Minn., to Orinoco Mining Co., New York and Venezuela.

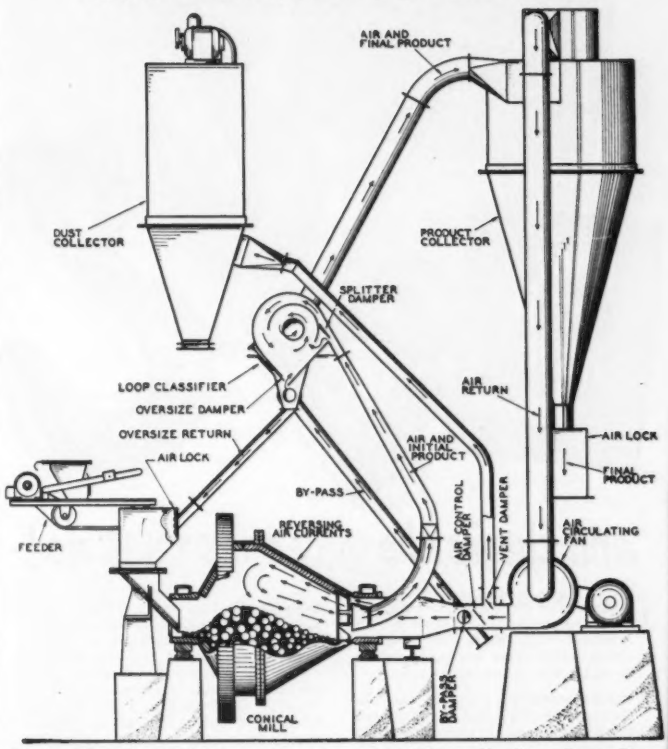
JOHN W. SHEEDY, is located in Murgul, Turkey, where he is superintendent of the Eti Bank's new copper mill. The mill and smelter have been put on a steady basis and the smelter is producing 20 to 40 tons of blister copper per day.

M. E. Pratt, formerly metallurgist with Round Mountain Gold Dredging Corp., Round Mountain, Nev., has joined the engineering department of American Smelting & Refining Co., at Patagonia, Ariz.

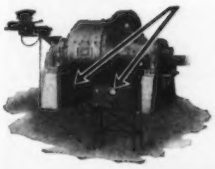
W. Spencer Hutchinson, Jr., has resigned as assistant manager of AEC Colorado Raw Materials at Grand Junction, Colo., and is now general superintendent at Eureka Corp., Ltd., Eureka, Nev. **George W. Mitchell** is vice president and managing director of the company.

Leo A. Baldwin, formerly general manager of the Virginia operations of W. S. Fry Co., of York, Pa., and general superintendent for the Linwood Stone Products Co., Davenport, Iowa, is now production and general manager of the Rayford Stone Co., Davis, Okla. He is also looking into several Oklahoma mineral deposits.

CONICAL MILL – LOOP CLASSIFIER PROVIDE EFFICIENT DRY-GRINDING



Product Can Be Varied from 20 to 200 mesh! With a Hardinge Loop Classifier in closed circuit with a Hardinge Conical Mill, a product as fine as 98% passing 200 mesh, or as coarse as 20 mesh, can be obtained, depending upon damper settings. No waste overgrinding of the fines or "cushioning" of the coarse material. For an extremely fine product the Hardinge Superfine Classifier is used. Write for Bulletin 17-B-1 on dry grinding.



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THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS

Harry J. Wolf, mining and consulting engineer, has returned to New York after spending some time in Arizona examining tungsten and copper ore deposits.

Charles A. Mitke has recently returned from a visit to the White Pine copper deposit in Northern Michigan, for the Defense Minerals Administration.

M. J. Sayers, metallurgist for The Galigher Co., Salt Lake City, Utah, is in Africa acting as metallurgical consultant for Newmont Mining Co. He will open a large lead-zinc mill in French Morocco which will be able to handle 4,400 tons of ore each 24 hr. and will be increased 50% as soon as it goes into operation.

GORDON T. BROWN, formerly chief engineer at the Theodore A. Dodge Enterprises, Tucson, Arizona, joined the Copper Canyon Mining Co., Battle Mountain, Nev., on March 1 as mine engineer.

Dr. Charles H. Behre, Jr., and **Parke A. Hodges** of Behre Dolbear & Co. recently spent some time in Haiti where they were engaged in professional work for the government of that country.

Otto Herres, vice president and a director of Combined Metals Reduction Co., Salt Lake City, is on leave of absence to serve as chief of the lead-zinc branch of the Supply Division, Defense Minerals Administration.

Edmund Newton and associates have formed a New Mexico corporation, Florida Mines, Inc., which plans to produce manganese ore from mines in the Little Florida Mining district, near Deming, N. M. Mr. Newton is vice president and general manager of the new company.

J. Carlisle MacDonald, assistant to chairman, U. S. Steel Corp., has announced that headquarters for Research Public Relations have been moved from Pittsburgh, Pa., and are now established in office of assistant to chairman at 71 Broadway, New York. **William J. Long**, formerly director of Research Public Relations, has been appointed special assistant

on Mr. MacDonald's staff to handle this activity.

Alberto Brazzini has recently come to Washington, D. C., as Peruvian delegate to the International Material Conference, Copper, Lead, Zinc Committee.

Fred Wise has been appointed a director of New Park Mining Co. to succeed **James W. Wade**, resigned. Mr. Wise is associated with the Newmont Mining Corp. and manages the Idarado Mining Co. at Ouray, Colo., and the Resurrection Mining Co. at Leadville, Colo., for them.

John B. Breymann III, formerly with Shenandoah-Dives Mining Co., Silverton, Colo., has joined American Cyanamid Co., Stamford Research Laboratory, Mineral Dressing Division, as a metallurgist.

Dr. C. O. Swanson, chief geologist of The Consolidated Mining & Smelting Company of Canada, Ltd., has been awarded the Blaylock Medal for distinguished service to Canada in the field of geology. The medal, given by the Canadian Institute of Mining & Metallurgy, was presented at the annual meeting in Quebec in April.

Carl R. Stout has been named works manager, and **George W. Kuerner**, superintendent, of the new aluminum plant to be constructed by the Aluminum Ore Co., a subsidiary of Aluminum Co. of America, at Little Rock. Mr. Stout has been mechanical engineer for the company since 1948, and Mr. Kuerner was assistant superintendent for the company's Mobile plant.

Leo H. Duriez, who has been manager of the Bayard Department of United States Smelting, Refining & Mining Co. in Grant County, since 1942, has retired. He has established his permanent residence in Alameda, Calif.

Conrad W. Thomas has been appointed mining engineer for Santa Fe Railway's Coast Lines, Los Angeles. Mr. Thomas, who was former director of safety at Los Alamos Scientific Laboratory, succeeds **Thomas O. Evans**, who will concentrate on Santa Fe's uranium ore discovery in New Mexico.

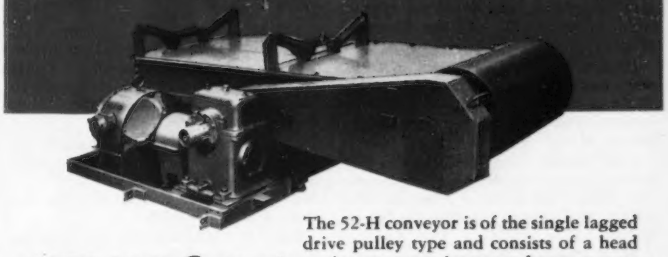
John H. Bassarear, formerly associated with Anaconda Copper Mining Co. in their General Laboratory in Great Falls, Mont., has accepted a position as metallurgist with National Lead Co. at the McIntyre development in Tahawus, N. Y.

Leslie M. Case, who served as chief of the mining machinery section of the War Production Board in World War II, has been named head of the mining machinery branch in the Defense Minerals Administration.

Bruce Kennedy, Lansing, Mich., has resigned as Michigan State geologist and assistant mine appraiser with Franklin Pardee. He has accepted a

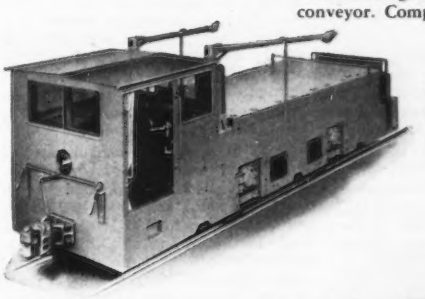
JEFFREY

METAL MINE EQUIPMENT



TYPE 52-H *Sectional* BELT CONVEYOR

The 52-H conveyor is of the single lagged drive pulley type and consists of a head section, power unit mounted on a separate skid, telescopic section, tail section and intermediate sections. Available for belt widths of 26", 30", and 36" widths. Can be used for gathering, transfer or feeder conveyor. Complete details on request.



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Jeffrey locomotives can be furnished in both trolley and storage battery types and with special protection against water drip and splash. Consult Jeffrey on your haulage problems.

Midget Blower servicing a Potash Mine.

AERODYNE fan ventilating a South Dakota Gold Mine.

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position with Pickands, Mather & Co. and will be located at Ironwood. **Harry J. Hardenberg,** division economic geologist, has succeeded Mr. Kennedy.

William S. Baxter, formerly assistant superintendent at the Eureka mine, Castile Mining Co., Ramsey, Mich., is now at the Montreal mine, Montreal, Wis., and is doing special engineering work on the Gogebic range.

Robert E. Prittinen, mining engineer, has joined the engineering staff of Jones & Laughlin Ore Co. and will be employed at the Tracy mine, Negaunee, Mich.

I. H. Wynne, plant designer for Reserve Mining Co., has been transferred from Milwaukee, Wis., to the offices of Oglebay, Norton & Co. in Duluth.

M. J. Gleason, Hibbing, Minn., who has been field superintendent of drilling operations for E. J. Longyear Co., has been transferred to the Minneapolis general office as assistant manager of the contract drilling division. He is succeeded in Hibbing by **E. G. Tucker.**

Edward Wisser, geologist, and **K. G. Schwegler,** mining engineer, have announced their association as mining and geological consultants. Their new offices will be at 422 Acheson Bldg., Berkeley, Calif.

D. D. McNaughton, formerly general pit foreman at the Wanless mine of Cleveland-Cliffs Iron Co. at Buhl, Minn., is a temporary member of the engineering department, Chino Mines Division, Kennecott Copper Corp., at Santa Rita, New Mex.

Charles Will Wright recently spent two weeks in Mexico. While there he discussed plans for the October joint meetings in Mexico City of the AIME, the GSA and the SEG and of the Third Congress of the Pan-American Institute of Mining Engineering & Geology which are to be held at the same time. The meetings are scheduled for Oct. 28-31, after which there will be three days for excursions.

P. H. Reagan, consulting mining engineer of Hye, Tex., returned to the United States in April after a trip to Europe, where he did professional work. He will leave this month for Australia.

Orson A. Rockwell, general manager of the Calumet Division, Calumet & Hecla Consolidated Copper Co., has been elected a vice president. He is a graduate of Michigan College of Mining & Technology and has had over 25 years of experience in the mining industry.

OBITUARIES

Gomer P. Jones, 84, one of the founders of the Association of Professional Engineers of British Columbia, and a life member of the Canadian Institute of Mining & Metallurgy, died at Vancouver, B. C., in March. He was a past president of the B.C. & Yukon Chamber of Mines.

Fred H. Johnston, 72, vice president and director of Goodman Manufacturing Co., Chicago, died at his home in Florida, March 19. He had been associated with the company for 46 years.

Jules LaBarthe, retired consulting mining and metallurgical engineer, died in Berkeley, Calif., April 6. He had built and managed many smelting and refining plants in the United States and abroad.

Thomas C. Russell, 68, former superintendent of Anaconda Copper Mining Co.'s phosphate mines at Conda, Idaho, died March 12. He had retired Jan. 1, 1950.

John W. Hildred, 66, engineer for Western Machinery Co., Phoenix, Ariz., died March 11. During World War II he served as chief engineer at the basic magnesium plant at Las Vegas.

Dwight Lewis Sawyer died in Sawtelle, Calif., in February following a lengthy illness. He was a graduate in geology and mining at Stanford University and worked for several large mining companies until 1935 when he became chief engineer of the Golden Queen Mining Co. He was 57.

Clyde T. Griswold, consulting geologist and mining engineer of Albuquerque, New Mexico, died March 22. A graduate of Amherst College and Columbia School of Mines, he was professor of mining at Colorado College from 1907 to 1910 and at Carnegie Institute of Technology from 1910 to 1914. In 1933 he established a consulting office in Albuquerque. During World War II he was general manager of the Pumice Corporation of America operation at Grants, N. Mex. His latest projects were the detailed geologic mapping of the Ortiz mine grant in Santa Fe County and consultation work on the recent uranium discovery near Grants.

Brent Neville Rickard

Brent Neville Rickard, metallurgist and retired operating executive of American Smelting & Refining Co., died March 8 in Tucson, Ariz. He was born in Anaconda, Mont., June 28, 1885 of English-Irish parents. His maternal grandmother, Mrs. Neville, arrived in San Francisco in 1856 and lived there throughout its growth from that time until 1904 when she joined Brent's parents in Denver, Colo. The California Historical Society, through the thoughtful courtesy of Brent, is now the possessor of some 40 large scrap books and 12 albums in which Mrs. Neville recorded interesting events in that colorful era of San Francisco's history.

During Brent's early childhood his parents moved from Anaconda to Denver where young Brent, during the time he was attending public schools in Denver, also learned assaying from his father, a chemist and assayer of repute. Brent thus was equipped to earn a living while still a student in the Denver Manual Training High School and he put his knowledge and skill in assaying to early use by leaving college in order to assist in financing the collegiate education of his two brothers. While his formal education was thus limited to one year in the University of Michigan, his practical technical education through experience was continuous from the time he first bucked a sample for his dad until he retired after 40 years of continuous service with AS&R during which time he rose from chemist to metallurgist to assistant superintendent to assistant manager and finally to manager of different units of the smelting branch of that corporation.

Brent's adult life was spent in Mexico and in the western part of the United States. A chronological summary of his professional career is to be found in Who's Who in Engineering as well as in Who's Who in America where details regarding his various assignments along with corresponding dates are available. However, these publications quite naturally make no mention of his personal characteristics and it is the purpose of this brief appreciation to bring some of these to the attention of those not fortunate enough to have had personal contact with a man who spent his life doing things for others. All who really knew Brent were fully aware of the continuity of his service to mankind.

Brent was the prospectors' and small mine operators' friend and confidant. None of their problems were too small for serious and considerate attention. He thought of public service as a duty to be cheerfully performed and his participation in many public activities endeared him to the hearts of youngsters and earned him the appreciation and gratitude of his fellow citizens. He took a very active part in the affairs of the AIME and of the American Mining Congress in whatever part of the United States he happened to have headquarters, and these organizations benefited greatly from his association.

During World War II Brent was "loaned" to Metals Reserve Co. from time to time to assist in some of their activities and his help was greatly appreciated by those with whom he came in contact.

Brent was truly a remarkable husband, a wonderful and thoroughly appreciated father and he had the good fortune to witness the early years of five grandchildren. In the words of one of the many young people he helped along the way Brent was truly an honorable man. The world is better off for his having lived in it.

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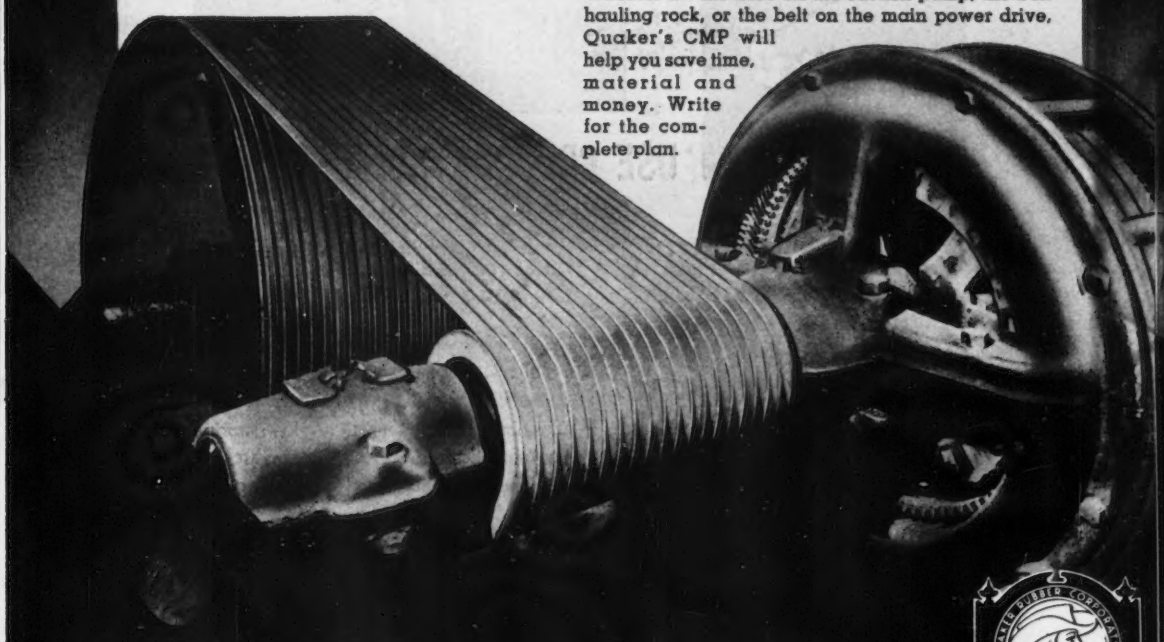

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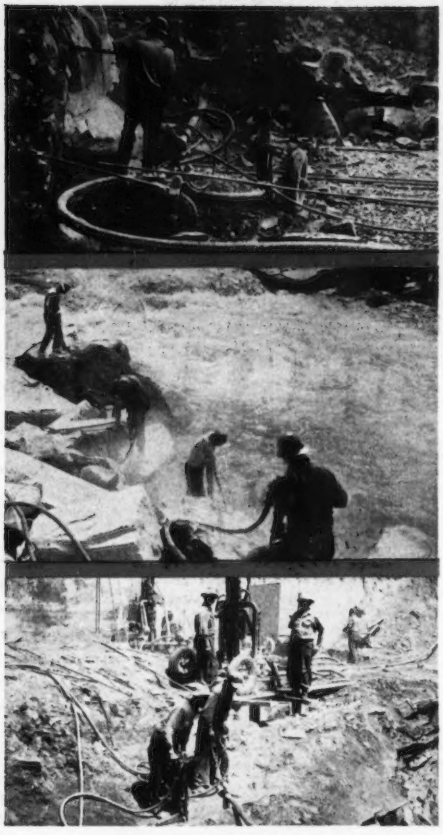
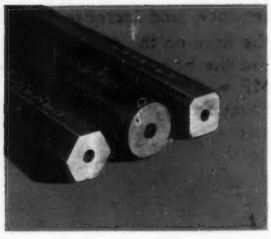


when the going's tough—



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The long life of Crucible Hollow Drill Steel . . . even under the severest drilling conditions, is the reason why you get lower cost per foot drilled when you use this high quality drill steel. This is no idle claim! Controlled hardenability, perfection of stress-bearing surfaces and uniform processing all contribute to your assurance of maximum performance.

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PREVIEW

Camera Speeds Duplicating and Cuts Costs

MULTIPLE COPIES of an engineering drawing, office form, letter, chart or report can be produced in 3 minutes by the use of the Xerox camera and equipment. Since the process requires no intermediate negative, xerography eliminates the need of a darkroom, plumbing, water, chemicals and other bulky equipment. The complete unit fits on a 3 x 5-ft. table.

Xerography, a dry, direct positive, electrostatic reproduction process, requires no film or sensitized material. A black resinous powder cascaded over the electrostatic surface of the specially treated xerographic plate performs the master plate making operation.

After the paper master has been made, the latent image is removed from the plate in a few seconds. The same xerographic plate may be used hundreds of times before it requires re-processing.

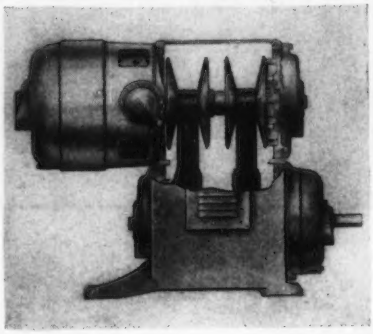
Xerox camera, according to the manufacturer, has a fixed focus wide angle lens. This permits copying on to paper masters of subjects with images on both sides of the page. Paper masters are then processed in the Xerox copier. Powdered image areas on the surface are made permanent by placing in the fusing unit for a few seconds. Thousands of copies can then be run off from the paper master.

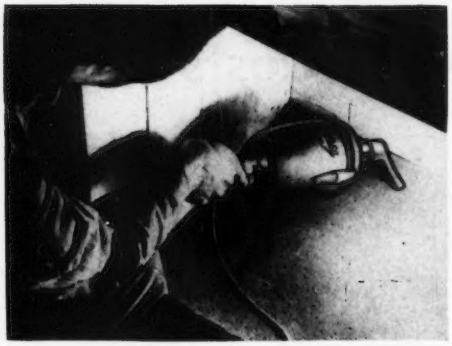
Each unit plugs into an a.c. outlet and any office girl can operate the equipment with little training.

For further information from the manufacturer, Haloid Co., Rochester, N. Y., circle number 1 on the postcard opposite page 126, and mail postage free.

EXPLOSION - PROOF MOTORS, conforming to Bureau of Mines Schedule 2E, are available in ratings from ½ to 60 hp., at 230, 250, 500, and 550 v., with stabilized shunt, compound or series windings. General Electric Co., Schenectady, N. Y. (2)

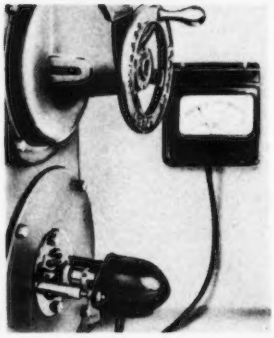
VARIABLE SPEED MOTOR with ratings up to 50 hp., carry the load through internal speed changing transmission with dual varibelts to prevent undue strain. U. S. Electrical Motors, Inc., Los Angeles, Calif. (3)





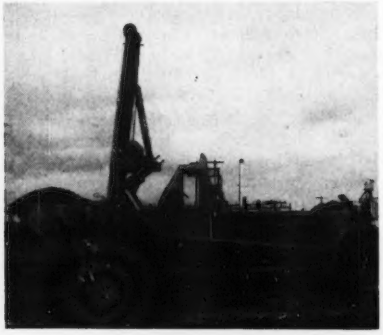
VACUUM CLEANER operates on compressed air (70 to 160 psi.). It is useful for cleaning up around the shop, particularly mine plants where compressed air is convenient. Made by Syntron Co., Homer City, Pa. (4)

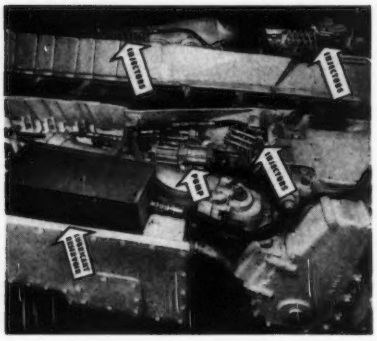
TIMER made by General Control Co., Boston 34, Mass., can be set to actuate load contacts at any interval from ½ sec. to 24 hr. Automatically resets for each new cycle. Timer is run by synchronous motor, 115 v. or 230 v. a.c. (5)



ELECTRIC TACHOMETER to serve Reeves vari-speed motordrives and transmissions is accurate and inexpensive. Indicator can be mounted 300 ft. from drive, improving accessability. Reeves Pulley Co., Columbus, Ind. (6)

SUPER - SCOOPMOBILE weighs 18 tons, has level capacity of 5 cu. yd., is powered by 250-hp. diesel. Carriage can be operated with track in any position. Mixermobile Mfrs., Portland, Ore. (7)





CENTRALIZED LUBRICATION SYSTEM to all air operated machinery to give automatic positive lubrication to all bearings. Hydra-Luber pump supplies lubricant from independent reservoir. Lincoln Engineering Co., St. Louis, Mo. (8)

POCKET-SIZE pH METER with probe unit, permits on-the-spot determinations. Accuracy of 0.1 pH is obtainable. Batteries last 1,300 operating hours. Analytical Measurements Inc., Chatham, N. J. (9)

WEMCO S-H CLASSIFIERS

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Lower initial cost, lower operating cost, and sharper separations—these are the advantages of selecting the right diameter, length, depth, tank design, and details for **your particular material and operating conditions.** Only the WEMCO S-H Classifier offers such a wide selection—and WEMCO's metallurgical staff is ready to aid you in applying the correct unit.

The following table shows a partial breakdown of more than 2,000 standard WEMCO Classifier models:

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1 SPIRAL DIAMETERS		A right diameter for every job, giving better balance between sand conveyance and pool area requirements.
2 SPIRAL PITCH		"S-H" (Special Helix) advanced pitch design on all models, giving up to 100% greater raking capacity compared to other designs.
3 SPIRAL LENGTH		Length furnished to fit exact needs of each job—correct lengths for closed circuiting—adequate drainage deck length for dewatering.
4 TANK STYLE		Tank styles to fit the characteristics of the material and the separation to be made—up to 25% greater "effective" pool area than other units.
5 POOL DEPTH		Generally Series 90 is used for 48 mesh and coarser separations, Series 125 for 48 mesh to 150, and Series 150 for 100 to 325 mesh separation.
6 ASSEMBLIES		Duplex units give nearly double the capacity of simplex units, but require less floor space than two separate units.
7 LIFTING DEVICE		Smooth, powerful hydraulic action is usually preferred to the older style screw lift.

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HMS PUMPS		THICKENERS
DENSIFIERS	HYDROSEPARATORS	SAND PUMPS
CONE SEPARATORS		CONDITIONERS
DRUM SEPARATORS	HMS LABORATORY UNITS	

Memos from the Manufacturers

- **New chief** of the Mining Machinery Branch in DMA is Chicago Pneumatic's Leslie M. Case. He held a similar post in World War II's WPB.

- **Expansion Notes. Crucible Steel** has begun work on a $27,250,000 program to expand capacity at Midland Works . . . **Connors Steel Co.** of Birmingham has let contracts for a $2 million plant expansion . . . Ground has been broken at Succasunna, N. J., for **Worthington's** new vertical turbine pump plant . . . **Reynolds Metals** has awarded the contract to build its $80 million reduction plant in Texas.

- **An experimental mine** for testing mining equipment is one of the unique features of the new research center to be built by Joy Mfg.

- **Two trust funds,** totaling $14 million, have been established by Westinghouse to administer contributions to the new employee pension program.

The Timken Roller Bearing Co.: Seward T. Salvage appointed advertising manager; Paul Reeves named director of sales.

Caterpillar Tractor Co.: C. B. Leber promoted to district representative with headquarters at Denver; W. J. McBrian, vice president, has accepted the position of vice chairman of the Munitions Board and will be on loan to the Government for several months.

Raybestos-Manhattan, Inc.: Kenneth A. Tamms has joined staff of the Abrasive and Diamond Wheel Dept. of Manhattan Rubber Div. as sales engineer for Wisconsin; P. H. Hagen to be attached to West Coast Sales Div., with headquarters in Seattle.

Nordberg Manufacturing Co.: Appointment of Paul S. Shirley as chief development engineer, Heavy Machinery Div. announced; Yaun Equipment Co., Baton Rouge, La., appointed distributor in southern part of state; Robert P. McBride appointed sales engineer, Heavy Machinery Div.

Link-Belt Co.: Harry G. Andersen, former district sales engineer at Milwaukee, named district manager at Birmingham, Ala.; Robert C. Becherer elected vice president; Richard Moyer appointed general manager of North Central Div., with headquarters at the company's plant in Minneapolis.

Worthington Pump & Machinery Corp.: F. C. Winter, manager for Harrison Works, to act as the corporation's manager of Defense Procurement; C. W. Camp, electrical engineer in sales department, named assistant manager of Defense Procurement.

Westinghouse Electric Corp.: Mark W. Cresap, Jr., management consultant, has joined company as vice president and assistant to president.

H. K. Porter Co., Inc.: J. R. Lewis appointed assistant general sales manager of Quaker Rubber Corp., a division of the company.

General Electric Co.: Newly appointed manager of manufacturing of Specialty Transformer & Ballast Divisions at Fort Wayne, Ind., is Elmer F. Paul; Donald Poland will replace Mr. Paul as manager of the Danville (Ill.) plant; K. O. William Sandberg named manager of Industrial Engineering Section; appointment of G. P. Foster as a district representative for two-way communications equipment for Commercial Equipment Div. announced; William W. Kuyper appointed engineering manager of the Knolls Atomic Power Laboratory, which is operated by GE for the AEC.

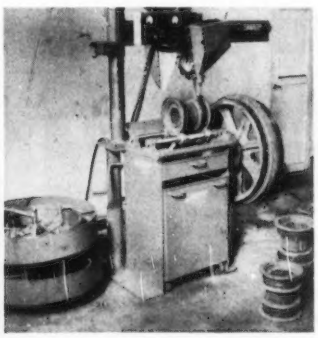
Byron Jackson Co.: Carl Blom elected a vice president, according to announcement made by E. S. Dulin, president.

U. S. Steel Corp.: Thomas C. Beattie, recently appointed general superintendent of Fairless Works of National Tube Co., to manage all operations of this subsidiary's new pipe mills being installed near Morrisville, Pa.

Osmose Wood Preserving Co.: John W. Storer, III, has joined the company to supervise Osmose's interests in the Lake States. He has also been managing timber treating plant at Bessemer, Mich.; Harold G. Burke to supervise company interests in southern West Virginia and eastern Kentucky.

Independent Pneumatic Tool Co.: Robert G. Faverty elected a vice president.

Oliver United Filters, Inc.: Temporary appointment of E. L. Oliver, Jr., as vice president and manager, has been made permanent; P. A. Hoyt, former vice president and manager, on leave of absence since last fall because of health, has retired both as officer and director; Russell L. Curtis, vice president of Dow Chemical Co., elected director.



◀AUTOMATIC WELDER made by Leader Welding & Mfg. Co., Berkeley, Calif., is used with success on worn rollers, pulleys, etc., at Peoria Tractor & Equipment Co., Caterpillar dealer in Peoria, Ill. (10)

CHAIN SAW New 27-lb. chain-saw powered by 4-hp. built-in gasoline engine made by Homolite Corp., Port Chester, N. Y., does the work of a two-man saw. Built-in governor prevents engine from racing when the saw is out of the cut. (11) ▶

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

FLEXIBLE TUBING. An 8-page folder put out by Flexible Tubing Corp. illustrates the versatility of "Spiratube." (71)

STRADDLE TRUCK. Featured in the new catalog just issued by Hyster Co., Portland, Ore., is the 30,000-lb. capacity model MHS straddle truck, especially designed for handling metal. (72)

MINING MACHINERY. All types of machinery manufactured by Nordberg Mfg. Co., Milwaukee, Wis., are described in 28-page bulletin 187. Design data and applications are included. (73)

WIRE ROPE. Data book, combining engineering information with an extensive catalog of a complete line of wire rope and chain fittings, has been offered by Thomas Laughlin Co., Portland, Maine. Several new products are included in catalog No. 150. (74)

BULLDOZERS. "Let's Talk Bulldozers . . . Built by Caterpillar" is the 16-page booklet issued by Caterpillar Tractor Co., Peoria, Ill., to explain how easy adjustments can boost production. Gives brief specifications of various diesel models and has a chart breakdown of optional D8 transmissions. (75)

RUBBER CONSERVATION PLAN. Here's a book full of tips on how to get more life out of rubber products from conveyor belts to V-belts. It's published by Quaker Rubber Corp., Philadelphia, Pa. (76)

SKIPS. Send for this informative booklet on the bottom dump skips (capacities 6-12 tons) built by Connellsville Mfg. & Mine Supply Co., Connellsville, Pa. (77)

VARIABLE SPEED DRIVES. An attractive 12-page bulletin #G-509, which describes the basic operating principles of Variable speed drives and contains rating tables and dimension drawings, is offered by Reeves Pulley Co., Columbus, Ind. (78)

VISCOSITY CONTROL. Catalog 88 describes "Viscorator" instruments that provide an instantaneous method for determining and controlling viscosity. Fischer & Porter Co., Hatboro, Pa. (79)

PROTECTIVE COATINGS. Description, application and technical data on "Roskote", corrosion resistant coatings for metal, wood and concrete, is put out by Royston Laboratories Inc., Blawnox, Pa. (80)

DIESEL ENGINES. Here's a dandy catalog describing Detroit Diesel Engine Div. of General Motors' (Detroit, Mich.) series of 2-cycle diesel engines. The book covers single and multiple engine units from 2 to 24 cylinders with power ranging from 32 continuous to 780 intermittent hp. (81)

HARDNESS TESTER. The Ernst patented, portable Metal-Hardness Tester gives immediate, direct readings on alloy metals by just pressing the handgrips at the sides. Read all about it in the 4-page folder (ET-65) issued by Newage International Inc., New York, N. Y. (82)

MILL MOTORS. A 20-page booklet describing 600-Series mill motors and Class 9500 d. c. magnetic mill auxiliary controllers is available from Westinghouse Electric Corp., Pittsburgh, Pa. (83)

ROTARY CRUSHERS. A rather sober folder (4 pages) issued by Sturtevant Mill Co., Boston, Mass., gives information, specifications and some photographs of the company's rotary crushers. (84)

TELEMETERS. Information on the use of the Metameter telemeter for remote measurement and automatic control of variables over distances ranging from a few feet to many miles, is described in bulletin DM029, published by Bristol Co., Waterbury, Conn. (85)

CONTROLLED AIR POWER. Thirty pages of photographs, technical data, diagrams and dimensions in bulletin CL-30 tell you what you want to know about the Bellows air motor, an air cylinder. Other "Controlled Air Power" devices are described in this bulletin from Bellows Co., Akron, O. (86)

CRANES. A 14-page catalog is illustrated and describes the new heavy duty line of ½-yd. Wayne Cranes (Capacities ranging from 8 to 12½ tons). Wayne Crane Div., American Steel Dredge Co., Inc. Fort Wayne, Ind. (87)

UNDERGROUND LOADER. Service Supply Corp., Philadelphia, Pa., announces an underground Lodover front-end and overhead gasoline or diesel-powered shovel with 1¼-yd. capacity bucket. The bucket is actuated by a system of hydraulic cylinders. The units are described in Form LO-300, a 2-page leaflet. (88)

HAND-HELD ROCK DRILLS. Two new Blue Brute hand-held rock drills, the WJ-45 and WJ-55, made by Worthington Pump and Machinery Corp., Holyoke, Mass., are described in bulletin H-1200-B42. Numbers of the drills indicate their weights. Both models have exceptionally powerful rotation. (89)

TENSION LINKAGE. Designers will be interested in this booklet by Baldwin Duckworth, Division of Chain Belt Co., Milwaukee, Wis. The term "tension linkage" as used in this book describes any chain applications in which linear movement of the chain is not continuous in direction. In a tension linkage, the chair need not be an endless belt as in a power transmission drive. Various types of roller chains used in tension linkage are described in Bulletin No. 51-10. (90)

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

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Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

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2	9	16	32	39	46	72	79	86
3	10	17	33	40	47	73	80	87
4	11	18	34	41	48	74	81	88
5	12	19	35	42	49	75	82	89
6	13	20	36	43	50	76	83	90
7	14	21	37	44	51	77	84	91

My Name ..... **Position** .....

Company .....

Address .....

Equipment Shorts

NON-MELTING WAXES. A series of non-melting waxes, already being used in the mechanical packing field, are expected to have wide application. Even if heated to the combustion point, these waxes will not melt. Flexrock Co., Philadelphia, Pa. (31)

GRAPHIC TECHNIQUES. Various techniques for making engineering drawings more easily understood, for presenting otherwise dry statistics and data, or for illustrating training manuals are now readily available from Technagraph Co., San Francisco, Calif. (32)

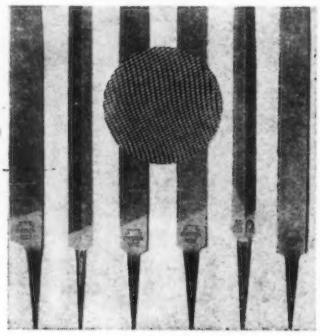
ELECTRONIC SECRETARY. This should end your worries about going out in the field and leaving your office phone unattended. Electronic Secretary answers the phone automatically, takes messages and tells the caller when you will return. The unit is easily installed and is not connected to the phone. Just plug it in and use. It can also serve as a handy portable dictation machine. Electronic Secretary Distributors Inc., Milwaukee, Wis. (33)

THREAD COMPOUND. If seizure of pipe, bolt and stud threads and gasket faces is a problem, you may be interested in Led-Plate. This metallic compound, with the advantages of both lubricant and sealer, gives effective results in temperatures from minus 350°F to plus 2900°F. The metallic elements, mostly lead, are held in suspension in hydrocarbons, and will not dry out, according to the manufacturers, Armite Laboratories, Los Angeles, Calif. (34)

ELECTRONIC INSTRUMENT READER. An electronic device to read test instruments at speeds up to 50,000 readings per second and record the readings on tape or punched cards ready for computation is available from Arthur D. Little, Inc., Cambridge, Mass. The unit, 20 x 30 x 5-in. in size, operating from 110 to 125 v., is easily incorporated in a variety of instrument reading and recording systems. (35)

WAGON DRILL. Ingersoll - Rand, Phillipsburg, N. J., announces a new wagon drill (FM-3) which is designed to permit unlimited drilling positions of the tower or drill guide. The manufacturer recommends it for any job where a large volume of sustained high speed drilling is required including building, construction, quarrying, and foundation work. (36)

FORK TRUCK. For all applications where loads are 2,000 lb., 48 in. long, Baker-Raulang Co., Cleveland, O., has a new Type FS center-control fork truck. Recommended battery is 36 v. and total weight with battery is 4,950 lb. (37)



STAGGER-TOOTH FILE has overlapping teeth that cut rather than scrape. This construction is the main feature of the new Bite-Rite brand of files introduced by Henry Disston & Sons. Overlapping teeth also produce a smoother cut. (43)

UTILITY CRANE. Rubber-tired, combination yard crane "swing" loader is available with telescopic boom extendable from 12 to 16 ft. Works on simple hydraulic system. Diesel or gas motor will propel unit 12 mph. Mandt Mfg. Co., Columbus, O. (38)

OXYGEN THERAPY UNIT. Portable model of the M-S-A oxygen therapy unit has been introduced by Mine Safety Appliances Co., Pittsburgh, Pa. Recommended for oxygen therapy work in industrial and fire fighting emergencies, this portable unit furnishes a flow of oxygen on inhalation, satisfying automatically, any breathing demand of the wearer. (39)

SLUSHER CABLE. In a new release, American Cable Div., American Chain & Cable Co., Inc., Wilkes-Barre, Pa., recommends a *one best* wire rope for slusher service. This rope has the following construction; 6 x 19 seale, Tru-Lay, improved plow steel independent wire rope core. For further information, use card below. (40)

VARIABLE SCALE. This looks like a time saver in problems involving spacing, scaling, proportions, graphical-algebraic calculations, odd scales and plotting. The manufacturer claims that the instrument will replace slide rules, scales, proportional dividers, graph paper and other instruments in a great many applications where combinations of these have to be used. The slide may be changed to any scale by finger tip control and metallic parts allow dimensional stability and accuracy. Gerber Scientific Instrument Co., Hartford, Conn. (41)

ALUMINUM ALLOY RIVET. A new aluminum rivet in the large size range and stronger than heretofore available has been developed by the Aluminum Company of America and is now offered on an experimental basis for use in heavy aluminum structures. Average rivet shear strength is 38,000 psi. Rivets are available in ⅛ to 1-in. sizes. (42)

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Colorado (*Continued*)

meters, spectrophotometers and a transmission fluorimeter have been made available. The latter device can register the presence of a thousandth-milligram of uranium in a dust particle.

According to engineer Duncan A. Holaday, "We are happy to have been called in for a thorough study well in advance of any specific health difficulties. From the nature of the exposure studied at mills thus far, we do not expect to discover any critical disease factors for some time to come—if at all."

★The Grand Junction regional office of the Atomic Energy Commission reports that **drilling for uranium has started in Utah's San Juan County.** The AEC said the work began with two diamond-bit drilling rigs and that there are now eight or ten engaged in the exploration. The work is west of Blanding and the AEC plans to drill about 100,000 ft. of core tests. A crew of 80 is handling the drills.

★**Idarado Mining Co.,** which operates the Black Bear mine through the Treasury tunnel has paid its first dividend of 40c. per share. Idarado is controlled by Newmont Mining Corp. which owns 87.3% of the company. Under the direction of Fred Wise of Ouray, Idarado is mining and milling 20,000 tons a month of gold-silver-lead-zinc-copper ore from the Black Bear and Ajax veins.

★**The Ophir tungsten mine** at Boulder, leased from the U. S. Vanadium Corp., has been re-opened by John McCristy and Elmer Swerdferger. The main tunnel has been cleared, and several hundred tons of stop fill, assaying over 1%, is already available. This grade is only marginal.

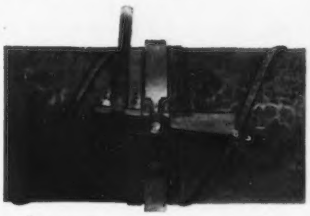
★Rehabilitation work has been carried on at the **Gold King mine** in Poverty Gulch at Cripple Creek, since the property was reopened in November, 1950, and preparations are being made for the actual mining of ore when the new Carlton mill is ready to receive shipments. Arthur J. Hogan, secretary and manager of the Cripple Creek Mining & Milling Co., has been in Cripple Creek since last November supervising the opening work at the Gold King.

★Reconstruction Finance Corporation officials say a new application for a $300,000 loan has been filed with the RFC by **Consolidated Caribou Silver Mines, Inc.** The silver and lead mining concern, which has been prospecting for uranium ore near Boulder ran into a turndown several weeks ago in its initial application for a $1,800,000 loan. At that time RFC officials indicated the concern might qualify for a loan as a potential producer of a defense-needed commodity, even though denied a straight business loan from the RFC.

★Crews of the Utah Construction Co.

1 Drive wedge into the two parallel lugs to open coupling.

2 Slip coupling over pipe end and put next joint of pipe in place.



3 Drive out opening wedge so coupling snaps into place on grooved ends of pipe.

4 Drive wedge home into the three lugs on coupling.

You can connect

NAYLOR PIPE

with a hammer...

when you use

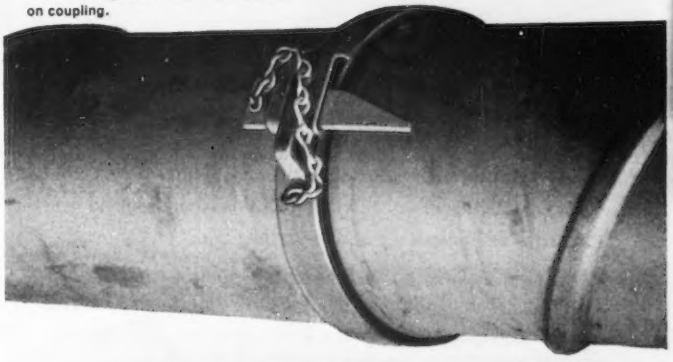
NAYLOR WEDGE-LOCK COUPLINGS

One, two, three, four—and the connection is made in seconds, not minutes. And a hammer is the only tool you need.

That's how simple it is to connect Naylor Pipe with Naylor Wedge-Lock Couplings. Built in one piece with gasket already in place, this Naylor Coupling provides a tight, leakfree joint faster than ever before possible.

Since the coupling takes up little more room than the pipe itself, it permits the line to hug the wall in tunnels or wherever space is limited. Lines can be made up with only one side of the pipe in the open.

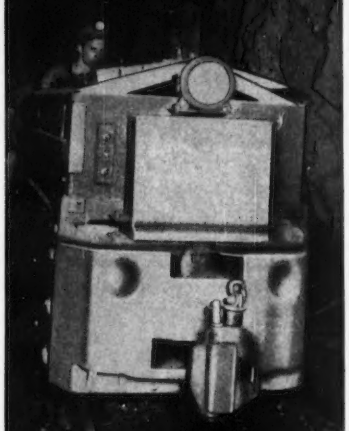
For the full story on this practical Naylor combination, write for Bulletin No. 507.



NAYLOR PIPE

Naylor Pipe Company, 1243 E. 92nd St., Chicago 19, Ill.
New York Office, 350 Madison Avenue, New York 17, N.Y.

How to keep them ON THE GO!



SHREWD MINE operators know that bogged-down locomotives, trammers or shuttle cars bring on blocked right-of-ways, snarled schedules and upped production costs.

They always keep this in mind when buying haulage batteries. Many have found that it is well worth the small extra premium to obtain the long life and dependability of rugged EDISON Batteries. EDISON cells are built of steel inside and out . . . they take temperature extremes, jars, jolts and accidents as part of the day's routine. Case histories show that many of them have fallen down shafts or been in fires or floods . . . and are still hard at work today!

EDISON Batteries are not injured by accidental short-circuiting or reverse charging, and can be charged direct from d-c lines in 6 to 7 hours without critical rate regulation. During shutdowns they can be stored indefinitely with no attention.

Write today for full information and a current price quotation. You'll find EDISON Batteries cost little more than other makes of batteries . . . and they pay this back over and over in terms of low upkeep and long, long life.

Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, New Jersey. In Canada, International Equipment Company, Ltd., Montreal and Toronto.

EDISON

Nickel · Iron · Alkaline

STORAGE BATTERIES

Typical Trammer Battery

Colorado *(Continued)*

of Salt Lake City are making good time in **extending the vital Leadville Drainage Tunnel** in Colorado, despite some adverse conditions. So far, the company has drilled the tunnel 1,000 ft. more than it was when work resumed last fall and the workers are now about 7,650 ft. from the portal.

IDAHO

★**Day Mines, Inc.**, have added the Alma group of 10 mining claims to their recent purchase of the Gold Hunter mine group at Mullan. The Alma group adjoins the Hunter on the east but shows no mineral discoveries so far as developed.

★**Sunshine Mining Co.** has now advanced the Metropolitan prospect crosscut on the 3,100 ft. level over one mile south of the Sunshine shaft and has just entered bleached quartzite formation. The objective point is the Big Creek fault, estimated to be several hundred feet further south.

★**Bradley Mining Co.** has continued **production of tungsten** concentrated from its Ima mine at Patterson, Idaho, through a low price period after completing construction of a new milling plant at a cost of $200,000. The company has 15 productive veins varying in width from 2 to 20 ft. The ore carries only from 0.5 to 0.8% tungsten in the form of huebnerite and a little scheelite, accompanied by varying amounts of silver bearing tetrahedrite, chalcopyrite, galena, sphalerite, molybdenite, pyrite, fluorite and rhodochrosite.

★**Sunshine Mining Co.** is now sinking to the 4,000-ft. level by extending a winze down from the 3,100-ft. level. The company has opened the Silver Syndicate vein on the 3,850-ft. level, proving high-grade ore in commercial quantities in this vein. The Sunshine, Chester and Yankee Girl veins will again be opened from the new 4,000-ft. level.

★In driving a crosscut on the 2,800-ft. level to open a copper-silver vein indicated by a diamond-drill hole, **Coeur d'Alene Mines Corp.** cut through a vein of ore when in a distance of 80 ft. which assays 7½% copper and 7 oz. of silver per ton, according to Dr. H. C. Mowery, president.

★**Lincoln Mining Co.**, obtaining its revenue through a 12% interest in the gross production of the Silver Dollar Co.'s one-third interest in the Rotbart area in the Sunshine mine, has declared a dividend of $18,734, raising its total dividend disbursements to $244,309.

★**Clayton Silver Mines Co.** in Custer County, Idaho, states that the silver-lead orebody on the 400-ft. level has been developed for a length of 280

ft., showing a width of 40 ft. of ore of the best grade yet found in the mine. The ore developed should supply the present 150-ton milling plant for a period of six years. No further depth can be gained until pumping facilities are increased.

★**Lucky Friday Silver-Lead Mining Co.** has declared an initial dividend of 5c. per share, totaling $64,574 on 1,291,480 shares of outstanding stock. The company has developed three productive veins of silver-lead ore, is down to the 1,800-ft. level and is currently producing 100 tons per day. The mine has been developed on its own resources without an assessment on its stockholders.

IRON COUNTRY

★**The 1951 season for shipping iron ore** from the Lake Superior ranges to lower lake ports opened on April 11 when five Pittsburgh Steamship Co. vessels carrying approximately 63,000 gross tons of Minnesota iron ore cleared Duluth and Two Harbors, Minn., "downbound". W. C. Hemingway, president of the United States Steel subsidiary, announced that 42 of the company's fleet of 61 vessels were in operation on that day, three weeks ahead of the opening of the 1950 season. Fourteen others will go into operation within three or four days, and the remaining five will be placed in service within 10 days, as soon as current repair work is completed.

Arrangements are being made whereby the producers of Lake ore will ship 5 million tons this summer all-rail. This ore movement is expected to disrupt coal shipments to the Lake ports. Cars ordinarily used to move coal will be carrying ore from the Duluth area to Pittsburgh, Youngstown and other furnace points. Ore men are reported to regard a total shipment of 90 million tons as essential for the 1951 season requirements, as compared with approximately 78.8 million tons in 1950.

★**All-rail shipments of iron ore** from mines of U. S. Steel's subsidiary, Oliver Iron Mining Co. to Eastern steel mills will be continued this season, according to R. T. Elstad, president.

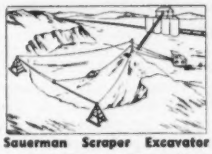
Oliver's rail ore shipments scheduled at present will average between 400 and 500 cars a day. They will be directed from the Gogebic and Mesabi ranges to U. S. Steel's furnaces in the Pittsburgh, Youngstown and Chicago areas, and to other iron and steel producers who depend upon Oliver for part of their iron ore.

★**Mines in the Iron River district,** on the Menominee range, began loading ore into railroad cars March 19 in preparation for the start of Lake shipments from Escanaba. The docks at Escanaba will handle some ore from the Marquette and Gogebic

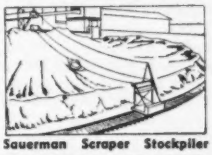
Whether it's digging, dredging, storing or reclaiming

a SAUERMAN MACHINE CUTS COSTS TO ROCK BOTTOM

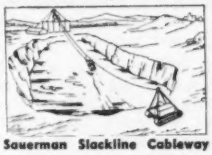
Picture shows a Sauerman drag scraper digging into a ridge of volcanic ash 250 ft. high and loading the ash into cars.



Sauerman Scraper Excavator



Sauerman Scraper Stockpiler



Sauerman Slackline Cableway

Sauerman Tower Excavator

Engineers and managers in construction, mining, processing, and other industries find that many problems of handling materials can be simplified by using one or the other of the various types of Sauerman Cableways and Power Drag Scrapers. These machines offer the particular advantage of being able to span a large area and move material at a rapid rate from point to point anywhere within that area.

The economic advantages of Sauerman Scraper and Cableway machines are as great as their operational advantages. The first cost of a Sauerman installation is reasonable, maintenance amounts to very little, and the simplicity of operation makes it possible to place the control of even the largest installation in the hands of one operator. Moreover, the equipment is very flexible; can be extended readily and otherwise adapted to changing conditions.

The different Sauerman machines are described in detail in a series of catalogs, liberally illustrated with drawings and photographs. Tell us about your material handling problems and we will send you the catalogs that will be of most interest to you. Or use the coupon below.

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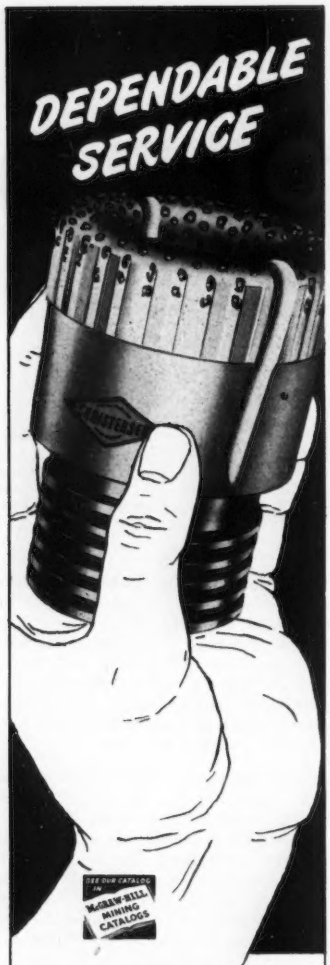

Direct from the manufacturer to you . . . Christensen Diamond Bits are designed to meet the strenuous demands of present day core drilling jobs.

Christensen's staff of Field Engineers are constantly on the job to give you the necessary service and assistance where needed.

LEARN MORE ABOUT THE CHRISTENSEN DIAMOND PRODUCTS

CHRISTENSEN
DIAMOND PRODUCTS CO.
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SALT LAKE CITY, UTAH

Iron Country *(Continued)*

ranges in addition to the regular shipments from the Menominee. The 1950 season was the first when Gogebic range ore, with a railroad haul of 200 miles, was shipped to Escanaba docks to take care of the excess beyond the dock capacity at Ashland, Wis.

★**Cleveland-Cliffs Iron Co.'s new ore boat,** now being built at Toledo by American Shipbuilding Co., is to be named after the company's chairman, Edward B. Greene. It will be delivered in 1952. Its capacity at 25-ft. draft will be 20,000 gross tons.

★**Oliver Iron Mining Co.** will build a new washing plant to treat Hull-Rust lean ore. For some years such ores have been shipped to the Trout Lake concentrator at Coleraine. The new plant will be located beside the present Hull-Rust crushing and screening plant, west of Hibbing, and the two plants will be interconnected by belt conveyors. The new plant is expected to be completed by fall.

The Oliver company estimates that it will ship about 5 million tons of wash ore concentrates from its Mesabi range plants this season.

★**A bill, to increase interest in the development of low-grade iron ore** in northern Michigan by long-term tax concessions, was given its first public hearing at Crystal Falls March 9. It is similar to the legislation proposed in Minnesota to assist taconite production. The areas which would be most affected by the bill are said to be in the Felch district of Dickinson county and the Republic area of Marquette county where the ores are magnetic.

It is proposed that the bill be revised to include all low-grade ores of the Upper Peninsula, such as gold and uranium and copper.

★**Pacific Isle Mining Co.** has produced about 55,000 tons of open-pit ore from its lease near Randall in Morrison County, Minnesota. The ore runs 54% iron, dry analysis, but is high in moisture, making it sub-grade on "natural" analysis, which is the way ore is sold. As far as now known, there is no large tonnage of this grade of ore remaining. A larger tonnage which runs about 40% iron is available. Enough of this material has been stockpiled so that experiments may be carried on for its beneficiation. Meanwhile, the pit has been allowed to fill with water pending solution of the beneficiation problem. About 50 ft. of stripping was removed to uncover the 54% ore.

★Dr. E. W. Davis has been granted a year's leave of absence from his duties as director of the University of Minnesota experiment station. He will direct the designing and building of an **experimental taconite processing plant at Babbitt, Minn., for Reserve Mining Co.** Dr. Davis and associates have worked out a method of crushing and beneficiating taconite at the experiment station with a 25-ton pilot plant. If the plant now planned, which is to be ready by next fall, is successful, a much larger plant will be built at Beaver Bay. H. H. Wade, assistant director at the station, will be acting director during Dr. Davis' absence.

★**Pickands, Mather & Co.** is sinking a new vertical shaft at its Ironton mine near Bessemer, Mich. The work is now down to ledge. The Ironton was opened up about 50 years ago.

★Work is progressing steadily at **Jones & Laughlin Ore Co.'s new Tracy mine** at Negaunee, Mich. The contractors, A. Lindberg & Sons, have moved more than 65,000 cu. yd. of dirt in grading at the site.

★At **M. A. Hanna's Morton mine,** stripping is being continued with a 170-B shovel, while the 1150-B 25-yd. dragline is casting a pump sump along the north and west sides of the pit.

★Republic Steel Co. expects to return its **St. Paul and Stevenson mines** to the shipping list this season. The Stevenson made its last shipment in 1948 and the St. Paul in 1949. The St. Paul has started stripping in rock.

★On March 8 **Inter-State Iron Co.'s Schley mine** received an award for operating one year without a lost-time accident. This qualifies the Schley for the Admiral's award by the parent Jones & Laughlin Steel Corp.

★Inter-State will begin stripping soon at its **Pettit mine** at Gilbert. A 6-yd. electric shovel, 3 tractor-drawn scraper units, nine 34-ton Euclid trucks, 3 bulldozers, a road grader and a truck crane constitute the chief equipment, much of which has been delivered. A large truck garage and a new office building will be built this summer. The Pettit adjoins the Schley, which Inter-State also operates and which will enter the shipping list this season. The Pettit is expected to produce ore in 1954. Its tonnage is estimated at 3,367,000. The mine was operated by Republic Steel by underground methods from 1902 to 1923. Three hundred acres have been acquired by Inter-State next to the Pettit-Schley-Hobart group for disposal of stripping, lean ore and taconite. Nearly 12 million cu. yd. of stripping will eventually be moved to exhaust the Pettit pit. About 8 million yd. of this must be removed to produce the first season's ore. The Pettit will employ about 114 men.

★John A. Beecroft, mine inspector for Itasca County, in his report for 1950, lists 39 active and 25 idle mines in the county. A total of 3,661 men was employed of whom only 195 worked underground. Underground ore shipped amounted to 434,407 tons out of a total of 12,942,647. The York mine, at Nashwauk, opened in 1911 and operated by Coates & Tweed from 1917 to 1947, was taken over

by the Pacifc Isle Mining Co. in 1948 and is still producing with over 3 million tons to its credit. Mines that had a record of no lost time accidents for the year were: the Arcturus, Oliver Iron Mining Co.; the Buckeye, M. A. Hanna Co. and the Bennett underground mine at Keewatin, Pickands Mather & Co.

★The Al Johnson Construction Co. has begun stripping at the **Whiteside mine of the Snyder Mining Co.** at Buhl. This is a former underground mine and was last operated about 35 years ago. Over 4 million yards of stripping will be removed from it and from the Kosmerl which adjoins it on the south.

R. M. Baker, superintendent of Snyder's Virginia mine, is in charge at the Whiteside.

★**M. A. Hanna Co.** held open house at its new Wauseca mine dry, near Iron River, on March 18. More than 500 people inspected the dry.

MICHIGAN

★**Cherokee Copper Co.**, which has maintained its corporate existence since it was organized in April, 1910, has received an offer to sell the property. The name of the prospective buyer was not given by officers of the company, who stated that action must first be taken by the stockholders. Proxies for a special meeting for this purpose have been placed in the mails. Such transactions as the sale of the company's real estate requires a two-thirds majority of the outstanding stock.

Originally, the stock issued amounted to 100,000 shares. The company went through incorporation in March, 1940, and but half of the above number of shares were issued at that time. At present, 43,180 shares are outstanding.

It is surmised that one of the operating companies in the Michigan copper district is interested in the purchase of the property, which consists of 800 acres in the so-called South Range district. It lies between the Bohemia Mining Co. area and that of the King Philip Co. In the immediate vicinity was the old Penn Mining Co. and the Belt Mines Co., Ltd. The Cherokee was organized with the purpose in mind of exploring an epidote amygdaloid bed supposed to have been some 35-45 ft. thick. The depth reached was 450 ft., with openings at 110 ft., 220, 320, and 420. Drifts followed the vein from each station, driven in 1917 for 653 ft. Activities were suspended in Dec. 1917.

MONTANA

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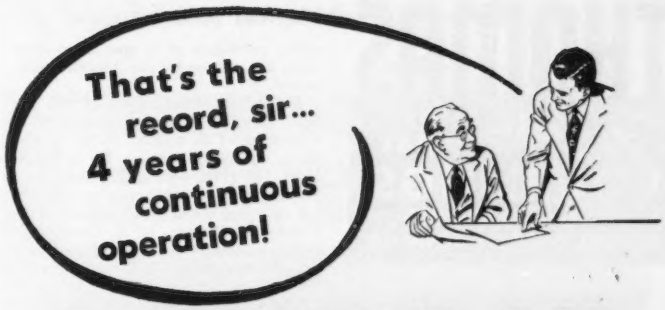

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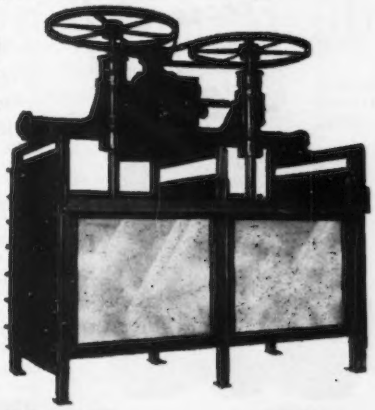

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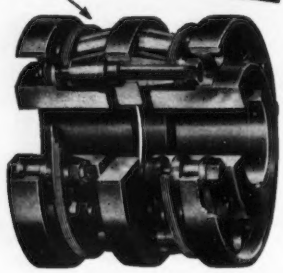

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Montana *(Continued)*

under provision of a special government bill passed by the Alberta legislature.

The bill is designed to permit export for the next five years of a maximum of 40 million cu. ft. of gas daily, or 10 billion cu. ft. annually from the Pakowki Lake field near Manyberries in southeastern Alberta.

The move follows a request from Charles E. Wilson, U. S. Director of Defense Mobilization, because of failure of reserves in the Montana Power Co.'s fields.

The supply of gas under the emergency bill amounts to about one-tenth the estimated supplies sought under other applications, presently shelved because of a lack of reserves, for export to the Pacific Northwest. The gas to be exported is dry gas, usable for fuel purposes only, according to government officials.

★In its annual report to stockholders, **Butte Copper & Zinc Co.** reports gross proceeds from sales of metals in 1950 totalling $6,881,246, exceeding by $699,981 the 1949 sales total, reflecting increased production as well as higher prices for manganese, zinc and lead. Net income for 1950 without deduction for depletion, was $692,080.88.

★**Alps Mining & Milling Co.**, operating a gold mine between Missoula and Maxville, in Granite County, Montana, has purchased the adjoining Argo group of 14 claims containing tungsten ore (ferberite), according to James P. Smith, president of the Alps. Mr. Smith further states that the tungsten ore will be milled at the rate of 100 tons per day in the company's concentrator.

★Victor Chemical Works, which is building a **$5,000,000 electric furnace plant to produce elemental phosphorous** at Silver Bow, Montana, west of Butte, has decided to double the plant at a cost of $10,000,000 according to August Kochs, Chicago, chairman of the company. The first part of the company's plant will be ready to go into operation in the fall of 1951 and the entire plant should be completed in the latter part of 1952. At the Maiden Rock phosphate mine of the company, south of Butte, 45 men now are employed. C. G. Derick, Jr. is superintendent of Montana operations.

★What is said to be the **first railroad car of ore containing pitchblende** (uraninite) ever shipped from Montana was recently sent out by the Elkhorn Mining Co. of Boulder, Jefferson County.

★**Mineral Hill Mining Co.**, Garrison, Powell County, Montana, was the only bidder for the lease of 360 acres of government owned phosphate lands in Powell County adjoining the land the company already is working. The operations are about 16 miles north of Deer Lodge.

NEVADA

★The Black Horse Mine in Esmeralda County has recently acquired a second ¾-yd. power shovel to step up its **production of tungsten ore.** At present three 10-ton trucks are hauling daily shipments of ore to the Pine Creek mill, 86 mi. away, and the shipments are expected to increase. The ore is being mined through open-pit methods. In addition to the two power shovels, the equipment being used includes two D-8 Caterpillar bulldozers, wagon drills and a large compressor. The ore occurs as a large irregular vein varying in width from 16 to 20 ft. and traversing a low hill.

★Construction of roads to the **Argentite and Nivloc mines** at Silver Peak in Esmeralda County is being planned for moving heavy equipment to the properties, to reopen the lead property in the Lone Mountain area. The lead mine is owned by E. M. Booth, well known Tonopah mining man. It is reported that the Silver Peak mines will be in operation by May.

★Crews are busy making repairs at the **Cordero mercury mine** near McDermitt preparatory to reopening the property. The Cordero Co. expects to get back into operation in the near future. Formerly one of the big cinnabar producers in the nation, the mine is expected to regain that position when it resumes operations.

★Golden Century Industries, Inc., an Idaho concern, is now engaged in **opening the Copper King** mine south of Carlin in Elko County. Frank Dean is general superintendent of the operations.

★Fred Vollmar, well-known Silver Peak mining man, is head of a group which has already taken over **two tungsten properties** in the Austin area recently, and which is negotiating for three more. Mr. Vollmar and his associates now have a total of 20 tungsten and manganese properties in central Nevada.

★**Tungsten-Carbide Co.** has announced its purchase of the stock of the Nevada Scheelite Co. which owns property in Mineral County near the old camp of Rawhide. Up to now, mining on the site has been carried to a depth of 300 ft. with a supply of ore blocked out which is said to be enough to last for a year or more at the present rate of development. Philip M. McKenna, of Latrobe, Penn., president of Kennametal, Inc., which controls the Tungsten-Carbide Co., said in Fallon recently that it is probable the present mine and mill crew will be increased as soon as housing can be provided.

★Robert Norris is **preparing to reopen his tungsten property** in upper Hope Valley in Douglas County. Plans include reactivation of the nearby mill in the Pine Nut mountains. The Hope Valley property was closed down about a year ago due to the low price of tungsten, and Mr. Norris has since

then been engaged in mining operations in northern California.

★**Gold Corporation of America** has acquired by option four of the productive quicksilver mines in the Ivanhoe mining district of Elko County. The sale was made by L. V. Pangburn, of Battle Mountain. Engineers have estimated there are at least 30,000 tons of ore in sight on the four properties, and there are two rotary furnaces on the site with a daily capacity of 100 tons of ore. E. L. Cleveland is president of Gold Corporation of America, and Peter J. Burfening is treasurer and general manager.

★**Mt. Wheeler Mines Inc.**, a subsidiary of Combined Metals, has begun preliminary work on a tunnel of the former St. Lawrence mine in White Pine County. It is expected that a showing of tungsten sufficient to warrant a large scale operation will be found as soon as the tunnel is lengthened.

★**Commercial grade copper ore in substantial tonnages** has been disclosed in the Ramal property northwest of Jungo. The Copper Queen, Red Butte and other mines in the same area were leased last year by Oscar H. Martin and James Payne, both Oregon mining men.

NEW MEXICO

★A lively interest in **uranium developments in New Mexico** overshadows other mining news this month. The Navajo Indians appear to be headed for wealth from underground resources of their 16,000,000-acre reservation. Last of March the Navajo tribal council authorized its advisory committee to work out a lease with F. H. Sitten, Inc., of Cortez, Colo., for 160 acres of land near Shiprock, for the erection of a mill to process uranium. Uranium, oil and natural gas are showing up on tribal lands.

★**Great Western Mining Co.** is shipping 40 tons of mica scrap from Mora daily. Robert Katson, secretary-treasurer, announces that the plant capacity will be raised to 80 tons a day. The present $150,000 mill uses an electrical process to recover 22% mica. Thirty persons are employed, John Habrel, formerly an instructor at New Mexico Highlands University at Las Vegas, is engineer in charge. Rufus Little, Santa Fe, is president of the company.

★Production of copper, zinc, lead and manganese in the **Silver City area**, southwestern New Mexico, has reached a point threatening to topple World War II records. Mines are operating around-the-clock shifts six and seven days a week.

★Duval Sulphur & Potash Co. has sunk two shafts more than 620 ft. in the **Carlsbad potash district** and expects to be in production early in 1952, according to W. Page Morris, manager. Commercial potash ores lie

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New Mexico (*Continued*)

between 800 and 1,000 ft. below the ground surface.

★The recent session of the New Mexico state legislature **ended confusion over severance taxes in the state.** An exemption of $200,000 intended to protect small companies, backfired when major companies claimed much of their oil production came from small individual well operations. A ⅛% rate now applies to coal, gold, lead, silver zinc, timber, molybdenum, manganese, fluorspar, uranium and pumice. Copper pays ½%; potash 2½%; oil 2½%; natural gas 2½%.

NORTH CAROLINA

★**Carolina Pyrophyllite Co.,** subsidiary of United Feldspar & Minerals Corp., Spruce Pine, N.C., began mining pyrophyllite on a commercial basis late in March in the Bowling Mountain section of Granville County. The work is being done on land owned by J. B. Mayes estate. Shipments will be made to Staley, N.C., where the company has a processing plant.

★**The Carolina Mineral Co. of Kona, N.C., has** begun construction of a **feldspar flotation plant** at Spruce Pine, N.C., which, according to R. W. Lawson, president of the firm, is expected to be in operation around Aug. 15.

The new plant will be about one-fourth the size of the one at Kona, and will be able to process between 150 and 200 tons of alaskite a day and employ between 40 and 50 persons.

OHIO

★George A. Fuller Co. has been awarded a contract by the Atomic Energy Commission for the erection of a **$30 million uranium ore refining plant** on a 1,200-acre site about 19 miles northwest of Cincinnati. When in operation, the new installation will be administered by the Fernald area of the AEC's New York operations office. About 1,200 workers will be employed to refine uranium ore into forms "suitable for use at AEC's fissionable materials production plants." No atomic weapons will be made at the plant.

OREGON

★**One hundred bauxite mining claims,** covering 2,000 acres west of Grants Pass in Josephine County, **have been** filed by a group of Portland people for the purpose of supplying aluminum-bearing ore to one of the Pacific Northwest aluminum producers. Content is reported to be from 22 to 52% alumina.

★**Contract for construction of a fourth plant at Albany** for the Bureau of Mines Northwest Electro Development Laboratory has been awarded to the Bechtel Corp., San Francisco. The Albany laboratory is producing zirconium, used in defense work by the government. The new plant will cost about $350,000. A third plant has just been completed at a cost of $90,000.

PENNSYLVANIA

★**A miniature blast furnace** at Pittsburgh, working with slag produced in steel production, may prove to be one of the most important furnaces in the country, according to the American Iron and Steel Institute. This furnace, 16 ft. high, started operating early in March in an attempt to recover the manganese in the slag from open-hearth furnaces. Some research metallurgists believe that an estimated 440,000 tons of manganese a year may be found in this country in economically recoverable open-hearth slag. That tonnage is equal to about 68% of the amount used in steel manufacturing during 1950. If the Pittsburgh furnace proves practical, a useful ferroalloy containing 80% manganese will be produced.

UTAH

★**The United Steelworkers of America, CIO,** have won representation of the main unit of production and maintenance at Kennecott Copper Corp.'s new Garfield, Utah, electrolytic refinery. The steelworkers won 260 votes from 547 eligible workers, with the unaffiliated International Union of Mine, Mill & Smelter Workers tallying 232 votes.

The United Steelworkers' victory is considered especially significant, since it is the CIO group's victory over the UMM&SW on Kennecott properties. George W. Haycock, union representative for the Steelworkers, has reported that his union has filed petitions with the NLRB challenging the mine-mill union's right to represent workers at Kennecott's nearby Arthur and Magna mills. Similar action is likewise pending in Nevada and New Mexico, according to Haycock.

★**Clear indications that open feuding** between the International Union of Mine, Mill & Smelter Workers (Independent) and the United Steelworkers of America (CIO) will complicate the writing of contract for the western copper industry in June arose in Salt Lake City this past month.

The CIO affiliate set the stage by virtue of an initial victory, first for the Steelworkers in copper, by winning bargaining rights over Mine-Mill at Kennecott Copper's new Garfield,

Utah, electrolytic copper refinery in early March by a 260-232 vote margin. George W. Haycock, western regional representative of the United Steelworkers promptly served notice that an NLRB election is being sought to determine representation rights at Kennecott's big Magna mill, where some 1,300 men are employed.

Late in March, thirty top officials of the IUMM&SW met in Salt Lake City to "evaluate present conditions" prior to a national wage-policy meet scheduled to start in Denver March 29. President John Clark of Mine-Mill, in the sole public statement coming from the closed Salt Lake City session, reported "terrific resentment" in union ranks about spiraling prices; expressed complete opposition to government wage-price policies, and predicted that "rank and file decisions" to be made in Denver would likely include demands for sharp wage boosts.

At Kennecott Copper Corp.'s Salt Lake City offices, spokesmen noted that Kennecott had no desire to find itself in the midst of a union dispute concerning the loyalties of certain men. "At present," the company's officials noted, "Mine-Mill is properly certified. When June comes, we will, under law, negotiate with the union that is certified by NLRB elections, if its leaders have signed proper Taft-Hartley affidavits." Kennecott spokesmen noted the copper concern had refused to deal with the Mine-Mill union some two years ago upon expiration of a former contract until its leaders had conformed with the Taft-Hartley provisions by signing non-Communist affidavits.

★Joint operations in the Park City district to explore the Crescent fissure are being pushed by the **Park Utah Consolidated Mines Co.** and the **Silver King Coalition Mines Co.** Crosscuts being driven on the 1,900-ft. level seeking an extension of the Crescent have reportedly encountered two small but excellent grade fissures in the Weber quartzite which may indicate good possibilities of bedding above the 1,800-ft. level in Park City limes.

Two crosscuts are thus being pushed in separate areas on the 1,700-ft. level in an effort to intersect these two fissures in the limes. One such crosscut reportedly encountered mineralization on the 1,700-ft. level in an area indicating possible extension of the fissure coming up from the 1,900-ft. mark. The other crosscut has as its objective bedding encountered 400 ft. farther north.

★A program of building and improving several hundred miles of access roads into the southern **Utah uranium-mining region** along the Colorado River is reported closely linked to increased production at the Vanadium Corp. of America's mill at White Canyon, on the Colorado. Pushed by the AEC, the Public Roads Administration and the Utah State Road Commission will expend $984,000 in federal and state funds in the region.

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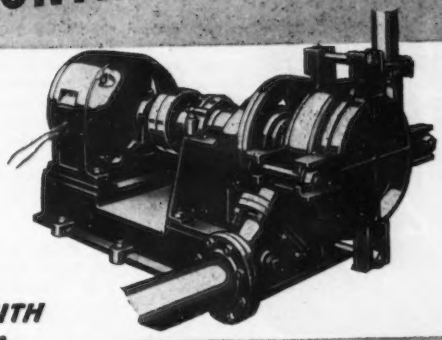

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WASHINGTON

★**American Zinc, Lead & Smelting Co.**, which operates the Grandview mine at Metaline Falls, started work several years ago on its Lead Hill holdings in the Slate Creek district northeast of Metaline Falls, but only recently announced important ore discoveries at that property. In the company's annual report the exploration activities in Washington were referred to as "very promising," and Howard I. Young, president, of St. Louis, confirmed the location as being that of the Lead Hill. It was reported by mining men in the district that several thousand feet of bulldozer trenching, considerable underground tunneling and some diamond drilling had been done last year.

★**Kromona Mines Corp.**, with property in the Sultan Basin west of the Cascades, built 3 mi. of road last year, the State appropriating $43,000 for the last 2 mi. according to a report to stockholders. The 1,800-ft. aerial tram which will drop ore 1,000 ft. from the tunnel site to the millsite has been partly installed. Equipment for a 100-ton mill to be installed this year is in storage at Gold Bar, while a new 10-kw. electric light plant is in storage at Everett. Development expenditures last year amounted to $85,000. An advance of 100 ft. was made on the north crosscut in the lower tunnel. The vein turning east was explored for 20 ft. It had widened to 8 ft. and an average assay showed 6.46% copper, 0.12 oz. gold, and 0.88 oz. silver per ton.

★**Sullivan Mining Co.**, which is working through the 6,000-ft. tunnel of Metaline Mining & Leasing Co., has found zinc-lead ore "in and out" for over 200 ft. in an angle raise above the tunnel level in Metaline Contact ground in the Metaline district, it is reported.

★**Columbia Lead & Zinc Mining Co.**, being financed under SEC regulation A with an offering of 400,000 shares at 10c. and total stock authorization of 3 million shares, expected to finish about 1,400 ft. of long-hole drilling by April 1, at its property in the Metaline district. This is known as the only independent venture in the area.

★Kaiser Aluminum officials announced early in March completion of modernization of existing facilities and installation of new finishing machinery at the **rolling mill at Trentwood** where capacity has been increased by 20%. The total output of both the Tacoma and Mead reduction plants can now be handled at Trentwood. The Mead plant is now the second largest in the nation and the third in the world because of the addition of 140 electrolytic pots bringing capacity of primary pig aluminum to 40 million lb. annually.

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CANADA

- B.C. Base Metals to Top $100 Million
- Strong Comeback for Waite Amulet
- New Financing for Labrador

BRITISH COLUMBIA

★**Aluminum Company of Canada** will pay an annual "rental" based on the price of aluminum, for hydro-electric energy utilized in its proposed $500 million development in the Tweedsmuir Park area of central British Columbia. Hydro potential of the project is estimated at 1.5 million hp.

That is the main feature of the agreement between the British Columbia government and Alcan disclosed by Lands Minister E. T. Kenney when he laid the formal text of the agreement before the provincial legislature. House approval is considered certain.

Alcan is preparing for a possible construction start with a 1953 production goal by expediting basic phases of its Tweedsmuir Park project, proceeding with building of a road to the powerhouse site on the Kemano River, a dock at Kitimat town and plant site, and diamond drilling at the dam, plant and smelter sites.

★Gross value of **base metal production in British Columbia** this year is expected to be well over $100 million. With new mines opening and old ones getting back into production to take advantage of the base metals boom, the value of 1951 output is certain to exceed the 1950 figure of $99,271,000. The figure was announced in the legislature by Mines Minister R. C. MacDonald, in answer to an opposition question. Value of 1949 output was $91,505,314. Mr. MacDonald said 78% of the base metals produced in 1949 was by Consolidated Mining & Smelting Co. and that royalties from base metal producers brought the province $3,628,430, of which CM&S paid 93%.

★Possibility that the **Aluminum Company of Canada** would turn its 1.5 million hp. hydro potential in British Columbia's Tweedsmuir Park area to the **production of titanium** before it starts output of aluminum has been suggested at Vancouver by Roy W. Brown, Vancouver Sun editorial advisor, after off-the-record investigations and consultations with power and mining men.

The inability of American Pacific Northwest power plants to provide the needed electricity for titanium in the face of other war industry demands is given as the reason for possible B.C. manufacture.

★**British Columbia's deposits of pyrites** are seen as a possible solution to the shortage of sulphur plaguing chemical and pulp and paper plants, by W. M. Rand, of St. Louis, president of Monsanto Chemical Co. Mr. Rand, on a visit to the Vancouver plant of Monsanto (Canada) Ltd., expressed the belief that use of the province's iron pyrites might become economical, thus producing iron ore for a B.C. steel industry.

★Development of **recently-discovered asbestos deposits** in the McDame Creek area is expanding, with Conwest Exploration Ltd., which acquired the discovery claims, now working on a development program. Another company in the field is Pacific Asbestos Ltd. of Vancouver, which has acquired eight claims in the area known as the Concord Group, between the discovery claims and a group owned by Asbestos Corp., Ltd. Government reports say the McDame Creek deposits contain chrysotile fiber of good length, principally as cross-fiber in veins in serpentine. Formed as a private company, Pacific Asbestos is now converting to a public company, and has been drilling on another asbestos deposit near Revelstoke.

★**Western Exploration Co.**, which is mining excellent grade ore across a width of 25 ft. on No. 8 level of the Mammoth mine near Silverton, is installing a 500-ton daily sink-float plant. Ore from the Mammoth started going to the mill in November, with output increasing from the low-point of $35,000 to $45,000 in January and an estimated $50,000 in February. Millheads are averaging around $27 a ton. Ore mined from the Standard and Enterprise mines in the year ended Oct. 31, earned a net profit of $109,672. Low-grade silver-lead zinc ore from the three mines and from mine dumps will be concentrated in the sink-float plant.

★A 1,000-ton plant is being considered for **Consolidated Mining & Smelting Co.'s H. B. mine** at Salmo which might eventually produce 5,000 tons a day of 6% zinc ore. A large tonnage of zinc ore carrying some values in lead is beginning to take shape, following extensive exploration and development. No decision as to production has been made as yet. Cominco has three other prospective producers, the Bluebell at Riondel, and the Big Bull and Tulsequah Chief in northern B.C.

★Lead and zinc ore, averaging more than 25% combined lead and zinc across 8 ft., has been opened on the

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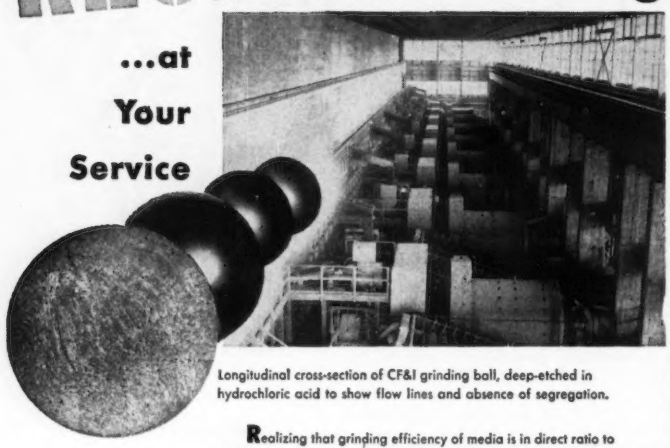

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Canada *(Continued)*

Premier Border Gold Mine Co., Ltd., property in Portland Canal district. Diamond drilling below the No. 6 level uncovered the ore zone, values in which compare with 12.45% lead and zinc milled in January and 16.67% early in February.

QUEBEC

★Surface drilling continues to add indicated tonnage at **Barvue Mines** in Barraute Twp., where 17.3 million tons can be calculated to a depth of 700 ft. Average grade from the first 54 holes is 3.27% zinc and 1.11 oz. silver per ton, with about 700 ft. still to be drilled toward the south.

★Adjoining Barvue to the north, **Pershcourt Goldfields** is planning shaft work. It will be of three-compartment size, with initial objective 650 ft. and 3,000 ft. of lateral work will be done as a minimum to explore the zinc-silver deposit outlined by drilling. Without much doubt the northerly extension of the Barvue orebody, the Pershcourt section has been drilled for 1,100 ft. with the northwest end still open for a long distance. Widths are considerably less than those of Barvue, but grade is somewhat similar. Three calculations of grade and volume have been made, based on various widths. Highest grade is in the footwall zone of the shear; 4.58% zinc and 2.12 oz. silver across 11.1 ft. for the 1,100-ft. length, to give 1,110 tons per vertical ft.

★Production of asbestos fiber was the highest in the **Asbestos Corp.'s** history. Its four producing mines, all in the Thetford Mines area, milled more than 3 million tons of ore. A fifth mine, the Vimy, will be added in the next couple of years. Two million dollars has been allocated to cover costs of development and mill construction.

★Underground development is starting at the property of **Federal Lead and Zinc Co.,** in the Gaspe area. Financed jointly by Sullivan Consolidated Mines and East Sullivan Mines, the property has been tested by some 10,000 ft. of surface drilling since last fall, and the most promising section, the Brandy Brook section, will be tested by an adit and 1,500 ft. of drifting.

★High-grade ore has been encountered by **Ascot Metals Corp.** in first development on the 235-ft. level at its Suffield mine. Adjoining the main property (near Sherbrooke, Eastern Townships) the Suffield mine is wholly-owned by Ascot and has been under development since last summer. Suffield has four known zones, of which the largest by a wide margin is the Adams. Drilling on this zone, has indicated 1,035,000 tons averaging 6.41% zinc, 0.59% lead, 1.34% copper, 2.38 oz. silver, and 0.011 oz. gold per ton. Ore from the new section is already going to the Ascot mill.

★ **Waite Amulet Mines,** Noranda subsidiary in the Rouyn area, made a strong comeback in ore position during 1950, the new East Waite orebody proving up to the extent of 700,000 tons averaging 4.0% copper, 3.0% zinc, 0.048 oz. gold and 0.88 oz. silver per ton.

As a result of this, and also the development of 200,000 tons of 2.75% copper ore at depth in the Amulet Dufault section, ore reserves at the end of the year had increased from 1.1 to 1.8 million tons, although 306,000 tons were milled.

ONTARIO

★**Hollinger Consolidated Gold Mines** had net profits of 50.6c. per share in 1950, and the best showing made by the veteran Porcupine gold producer since 1943. Ore reserves stand at 5.5 million tons, well over four years' supply, at the main property. The old mine still has many years of life ahead, for more than 38% of 1950 production came from above the 800-ft. level. The smaller Ross mine in the Munro area, which mills about 300 tons daily in comparison with the original mine's 3,700 tons, is still growing at a moderate pace. Ore re-

serves there are at an all-time high of 800,000 tons, the reserve having shown an increase in each of the past four years.

★**Steep Rock Iron Mines** is looking forward to another year of progress in 1951. Last year's output of 1,200,000 tons should be bettered by a slight margin, but a more important factor will be the start of underground development at the Errington mine and the continued preparation of the Hogarth mine for open-pit mining. The schedule calls for annual production of 3,000,000 tons by 1955 from the company's own operations, with additional gain to be made from royalties returnable on the sections optioned to Inland Steel Co. and the Pickands. Mather group. Unofficial observers now regard the Inland section as potentially bigger than either of the company's two main mines, though much more work will be needed to prove its possibilities.

LABRADOR

★Both **Labrador Mining & Exploration Co.** and **Iron Ore Company of Canada** have increased their capital structures to aid the financing of the rapidly developing Labrador-Quebec iron field, from which 10 million tons of iron ore will be rolling down to the St. Lawrence River annually in a few years.

IOCO was formed in 1949 to bring the new field to production. Its biggest shareholder is Hollinger Consolidated Gold Mines, the Hanna interests of Cleveland holding second largest investment. IOCO's holdings were obtained from Labrador M. & E. and from Hollinger North Shore Exploration Co., both Hollinger-controlled. Indicated high-grade iron ore now in sight on the two concessions is calculated at 418 million tons, in addition to which 100 million tons of beneficiating ore has been drilled. Work is proceeding with all dispatch on the railway being built from the area to the river, and it is hoped to have the line operating by the end of 1954, a year earlier than originally planned. Hollinger's direct and indirect interest equals 25%.

MANITOBA

★**San Antonio Gold Mines, Ltd.** announce a gold production for the year 1950 of $1,876,066. Ore reserves showed a total of 710,000 tons, of which 180,000 tons are broken. Operating costs were $5.75 per ton of ore treated against $6.43 in 1949. Tonnage milled was down from 185,735 tons in 1949 to 177,900 tons. Recovered grade improved from 0.263 oz. per ton to 0.276 oz.

★**Sherritt Gordon Mines Ltd.** report that approximately 10,000 tons of freight is being moved into the Lau-

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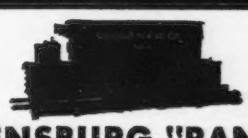

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Canada (*Continued*)

rie River power development site. This plant, when developed, will provide power for the Lynn Lake nickel property. The Canadian National Railways is giving consideration to the construction of the 160-mile rail line from Sherridon to Lynn Lake. A reconnaissance survey is in progress at the present time.

★**Little Herb Mines** has been formed to acquire and operate the property of Ferguson Mines, a 44 claim group located in the Herblett Lake area, Manitoba.

★**Maskwa Nickel Chrome Mines Ltd.** has been formed to consolidate the holdings of several mining groups and syndicates in the Bird River-Maskwa Lake area. Falconbridge Nickel Mines and Ventures Ltd. will provide the initial finances to develop the amalgamated holdings consisting of 121 mining claims.

YUKON

★**Yukon Consolidated Gold Corp.** has moved its No. 11 dredge 5 mi. down stream. Its camp is to be located at the mouth of Last Chance Creek about 12 mi. from Dawson. Caterpillar tractors will make the transfer. A wage raise of 5c. an hour, retroactive to Jan. 1, was accepted by about 200 workers on the gold dredges in the Dawson district. Workers will also receive six paid statutory holidays, 10c. a day board reduction, and a cost of living bonus of $2 a day.

★**"Laforma" mining property,** consisting of 19 quartz claims about 40 mi. west of Carmacks, has been optioned from W. J. Langham and Emil J. Forrest by a Toronto mining engineer who has eastern backing. It was reported that the first payment had been made, and monthly payments were to start April 1, with final payment possible within 12 months.

IN EUROPE

AUSTRIA

★**The United Austrian Aluminum Works** in Ranshofen is expected to be able to keep at least 70% of its plant operating this summer despite the chronic power shortage. If successful, the plant should raise its 1951 output to 16,000 tons, from 12,000 tons in 1950. Lacking large and high-grade deposits of bauxite, Austria has been trading semi-finished aluminum products for bauxite from France, Yugoslavia, Italy, and Germany.

GREECE

★Marshall Plan authorities will finance attempts to speed up production of **manganese ore** in Greece. Funds will be given first to two Greek firms for exploration for manganese on the island of Samos, and in the Granitis district on the mainland. The money will come out of the ECA's counterpart funds. The firms in question will contribute up to 30% of the cost of the exploration. ECA advances will be repaid in shipments of ore to the U. S. stockpile.

GREENLAND

★The Danish Government is said to have been negotiating with a British mining firm for assistance in developing the recently-discovered **lead deposits in Greenland.** Reliable reports have indicated the presence of substantial tonnages of a good grade of lead ore, but the climatic conditions make it extremely difficult to establish a mining operation on the spot. So far the Danish Government has talked with at least one American company, one Canadian company, and

now, apparently, a British company. The Government was also at one time reported as having decided to go ahead on its own without foreign technical or financial help.

ITALY

★In the first 10 months of 1950, **Italy produced 279 kg. of gold** from 41,237 tons of ore, employing 447 workers in the process. At the official price of gold, this indicates an average grade of around $7 per ton of ore.

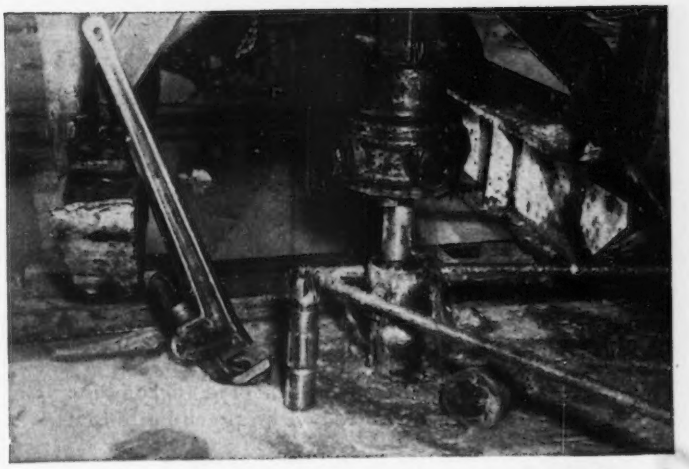
★The Italian Government is getting together **a new mining code**, and has already released some details on what will go into it. For one thing, the Government will be recognized as the principal party in any prospecting that is done from here on. The national interest will come first in all cases. Prospecting permits will be granted for periods up to no more than three years. All permits granted before Dec. 31, 1944, are going to be reviewed by the Government's mining office. There is to be no speculation in mineral deposits.

★Italy, as the second largest producer of sulphur in the world, has been trying hard to increase output. An optimistic forecast made by the **Italian Sulphur Corporation** to the O. E. E. C. in Paris is that sulphur output could be held at 200,000 tons through 1952, and increased gradually thereafter to 450,000 tons annually by the end of 1951. This doubling of production is contingent on finding new deposits and on getting adequate equipment. The Italian Government has, in this case, turned the problem of finding new deposits over to the Italian Sulphur Corporation, which will spend around $1.5 million on exploration and research in the coming months. The Government has already allocated about $13 million for new equipment for sulphur mining, and a further $5 million will be needed. The plan calls for adding 6,000 persons to the 14,000 already employed in the sulphur industry.

ENGLAND

★**British Aluminum Co., Ltd.**, describes as "utterly without foundation" a February press report stating that the company planned to build a $33-million bauxite reduction plant in North Borneo. As reported in E. & M. J. for March, 1951, the company is considering a reduction plant in Borneo or in the Gold Coast, but no definite decision has as yet been reached. The company's Gold Coast bauxite ores are now being treated in Scotland, where there is ample electric power.

★The British Government will try to get **tungsten production** in England started as soon as possible. Mean-



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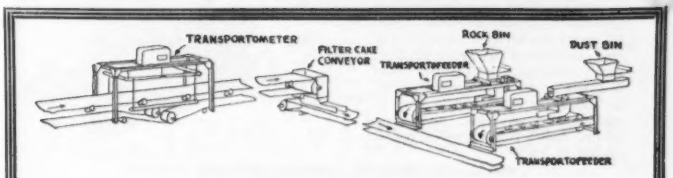

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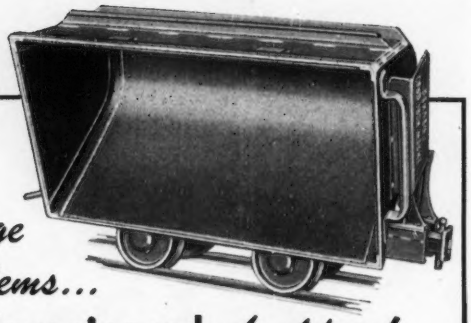

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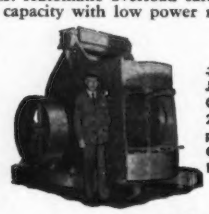

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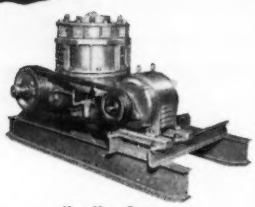

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England *(Continued)*

while, the Government is doing everything it can to increase Brtain's imports of tungsten ore.

NORWAY

★A large consignment of **iron ore from the United States** is said to have arrived in Norway recently for test purposes. The ore will be put through a concentrating process devised by A/S Titania, a firm in Sokndal, South Norway.

FRANCE

★Add France to the list of countries suffering from a **shortage of electric power.** Owing to the lack of power, France has had to put export controls on aluminum and some of its products, despite the country's accustomed position as an exporter of aluminum.

SWEDEN

★In the face of a rapidly expanding world-wide market for **Swedish iron ore,** and a steadily rising price, Sweden finds it impossible to increase production significantly this year. Factors involved in the static output are: manpower shortages; lack of rail capacity to move more ore to the coast; increasing home demand that cuts down exports. Germany takes most of the Swedish iron ore that is exported, its orders for 1951 running up to 4.85 million tons, or about one-third of the estimated 1951 output. Among the largest new customers for Swedish iron ore was the United States, which took nearly 2 million tons in 1950 against 300,000 tons or so in the prewar years.

IN LATIN AMERICA

BRAZIL

★**Percival Farquhar,** 86-year-old pioneer of Brazilian iron mining, is in the news again with the statement that "the best steel in the world from the best iron ore" will be produced at the new plant of **Cia. de Acos Especiais Itabira,** near Coronel Fabriciano, Minas Gerais. Initial capacity is expected to be about 55,000 tons a year of special-purpose steels. This plant has been mentioned repeatedly ever since the original Itabira iron ore mining project got under way, with Export-Import Bank assurance, late in World War II.

★Shipments of iron ore from Itabira in 1950 brought a net profit to the **Cia. Vale do Rio Doce** of $1,150,000, which liquidated some of the previous debt of the company and allowed formation of a depreciation fund. This amount, however, is only 1½% of the fixed capital of the company, and is barely 1% of the company's assets. The company hopes to get another $15 million of new investment, by which, it asserts, it could raise output of high-grade iron ore to 3,000,000 tons annually. Exports from the company's mine came to 721,765 metric tons in 1950.

★Brazil has around 1,800,000 tons of **zirconium ore** on the plateau around the city of Pocos de Caldas northwest of Sao Paulo, according to a recent report of Carlos Dias Brosch of the Sao Paulo Institute of Technological Research. The chief mineral is badelleyite (zirconium oxide) plus a little zirconite (zirconium silicate).

★A knotty legal problem has arisen in connection with development of **manganese ores near Urucum**, close to the Brazilian-Bolivian border. Brazilian law forbids ownership by a foreigner of any Brazilian border lands. U. S. Steel has a 49% interest in the company doing the development work. The Export-Import Bank has an application before it for a $30-million loan on the project.

★**Tungsten ore exports** to the United States through the port of Santos dropped from 68 tons in 1948 to four tons in 1949, rose again to 17 tons in 1950. This year should see quite an increase.

COLOMBIA

★**The emerald mines of Muzo**, Government-controlled and closed for the past year, were reopened in January. An emerald of 1,800 k. was found in February, one of the largest stones ever taken from the mine. Total emerald output of Colombia in 1947 was only 4,000 k. It rose sharply in 1948 to 54,000 k. reached a peak in 1949 of 71,000 k., then fell off again in 1950 with the closing of the Muzo mine.

MEXICO

★**The first major settlement** in the threatening general strike in Mexico's mining industry came with the signature of an agreement on April 10 between the Miners' Union and the **Fresnillo Company**, large lead-zinc mine in Zacatecas. The company granted a straight 14% wage increase. At the same time a Presidential Committee investigating problems of mine workers released a report calling for unspecified wage increases in all mines according to a formula based on the rising prices of metals,

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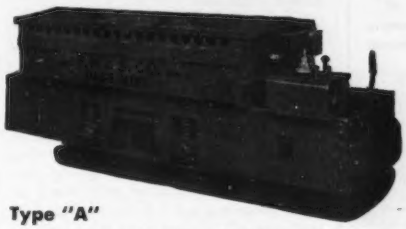

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Mexico (*Continued*)

but including allowances for increased costs and taxes. The Committee called for a peaceful settlement of all negotiations in view of the tense international situation.

★**When the so-called "hunger marchers"** from the struck Palau coal mines reached Mexico City recently, they met with none of the force or violence their leaders had predicted. Instead the marchers were given free camping space and a daily ration of food from the Government. Otherwise they were ignored. The group has gradually disintegrated, with many of their leaders simply disappearing. The men are left to find their way back to Palau, over 1,000 miles away, as best they can. The strike at the coal property, and the march, were led by Communist-dominated factions.

★Antonio Martinez Baez, Secretary of Economy, has announced discovery of a "very rich" **sulphur deposit** in San Luis Potosi. Although the discovery was made on private property, the Government will handle mining of the sulphur, owing to the critical need of the mineral. Production of the new orebody will probably go into export.

★Pemex, the Mexican oil monopoly, has opened **a new sulphur recovery plant** near the Poza Rica oil field in Northeastern Mexico. The plant was built with the help of the General Chemical Division of Allied Chemical.

★**Here are the monthly average** production figures for the major metals produced by Mexico's mines:

Metal	Monthly Average Output 1949	1950
Gold, oz.	33,797	34,012
Silver, oz.	4,120,000	4,120,000
Copper, tons met.	4,770	5,142
Lead, tons met.	18,404	19,840
Zinc, tons met.	14,867	18,302

Thus far in 1951, production of all these has declined, with the exception of lead, which is probably running above 25,000 tons a month.

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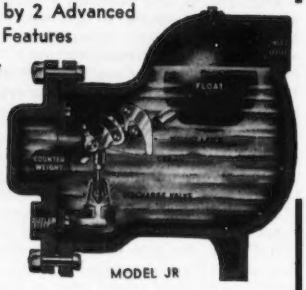

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IN INDIA

★Late in March the New Delhi Government announced that henceforth the following products **may not be exported** from India: all virgin metals; semi-fabricated metal products; non-ferrous metal alloys; ores and concentrates of copper, lead, antimony, and tin; scrap metals; all metallic imports. The Government will consider applications to export alloys of lead-tin-antimony of the solder and type metal variety. Export of zinc ore or concentrate, alumina, and certain other metallic residues will be permitted, provided that a guarantee is given that 50% of the contained metal will be returned to India.

★**Production of manganese ore** from the Shivrajpur Syndicate, one of India's largest producers, increased 2½ times in 1950. The jump from 13,763 tons in 1949 to 36,054 tons by Nov. 30, 1950, is attributed to increased demand from the United States. The company has entered into forward contracts involving 175,600 tons, or about 75% of its production over the next three years, plus stocks on hand. The company plans to spend nearly $100,000 in expanding production facilities to handle 60,000 tons a year.

IN THE PHILIPPINES

★**Gold output** from the five producing Philippine gold mines showed little change in January and February from the 1950 monthly average. Benguet-Balatoc led the field with an output of 30,930 oz. from 137,800 tons milled in the two months. Next was Mindanao Mother Lode, with 10,591 oz. from 21,000 tons. Following them were Atok-Big Wedge with 8,680 oz. from 27,500 tons, and Surigao Con. with 6,814 oz. from 19,500 tons.

★**Lepanto Consolidated** maintained its high output of copper-gold concentrate, milling 57,714 tons in January, with production valued at $1,267,400.

★**Gold mining companies** are deeply concerned by the threat of the Central Bank of the Philippines to make them turn over more than the present 25% of their gold output to the Bank at the statutory price. Most gold producers have been able to get around 100 pesos for the remaining 75% of their gold in the Manila free market. Since the first of the year, this price has climbed steadily, reaching 152 pesos in the middle of March. This climb reflects the depreciation of the peso in terms of the dollar. Dividends paid by Philippine gold mines in 1950 totaled 6,976,300 pesos, or $3,488,150 at the official conversion rate of 2:1. Largest dividend payer was Atok-Big Wedge with $1,148,750 disbursed last year.

IN AFRICA

★In 1950, **Morocco produced:** 65,000 tons of lead, double the 1949 output; 257,000 tons of metallurgical manganese, up 42% over 1949; 3,509 tons of cobalt, more than twice 1949's output; and 22,500 tons of zinc, up four times.

★**Mineral production** in Southern Rhodesia set new records in 1950 with a total value of gold and base minerals produced of over £13,000,000. Of this, gold contributed more than £6,000,000, the highest value since 1942. **Beryllium ore,** which has not previously been mined in Southern Rhodesia, was produced in a quantity valued at £62,525. Asbestos, chrome, and coal were the chief mineral products other than gold. In Northern Rhodesia mineral production in 1950 was valued at £49,942,000, with copper accounting for 85% of it.

★Minister of Finance for South Africa, N. C. Havenga, promises to lay **an additional tax burden** on mining companies this year by proposing to return to the 1948 formula for calculating gold mine taxes. This would increase their taxes about 5%. Taxes are to be increased on diamond and base metal mines as well, if Mr. Havenga's budget goes through. He asks no increase in taxes on individuals, and suggests removal of the excess profits tax but calls for increased normal tax rates on companies.

★**South African Minerals, Ltd.** announces arrangements with U. S. Steel Corporation for regular shipments of manganese ore from its properties in Southwest Africa. Estimates based on gravimetric surveys indicate reserves of 5,830,000 tons of ore, but recovery, in terms of 48% concentrate, will be only about 50% of the ore in sight.

★**West Driefontein Gold Mining Co.** reports an intersection of the Carbon Leader reef giving the high assay of 1,233 in-dwt. at a point 3,797 ft. below the collar of its No. 1 shaft.

INAUSTRALIA

★**Australian gold production** of 853,467 oz. in 1950 was at its lowest ebb since 1946. It was 35,590 oz. lower than in 1949, a decrease of about 4%. Employment in the industry dropped from 11,653 in 1947 to 10,409 in 1949. Figures for 1950 are not yet available. Two states, Queensland and Tasmania, showed an upturn in production last year compared with 1949, but this was due to gold being won as a by-product of copper and other metals. The Northern Territory alone stood out as an aggressive production area, setting a new record of 35,443 oz. The previous record, established in 1949, was 29,781 oz.

★**A tragic decline** in ferrous and base metal production is apparent from recent statistics. Production for a recent months' period compared with the corresponding period a year ago was: Pig iron, 274,800 tons (334,900); ingot steel, 204,200 tons (361,000); lead, 41,500 tons (54,900); and zinc, 18,370 tons (21,670). The continuous skidding of production since the onset of the Korean crisis is largely the result of Communist-inspired strikes.

VICTORIA

★The prospectus for an issue of 6,715 £3 shares in **Black Cameron Gold Mine N. L.** states that the company is to purchase the Black Cameron gold mine at Smith's Gully, 13 miles north of Warrandyte. The mine is stated to be in production on ore averaging 35 dwt. a ton.

TASMANIA

★**King Island Scheelite (1947) Ltd.,** purveyor to the U. S. and U. K. governments under recent long-term contracts, is planning to boost its output by 50% within a year. In the year ended October 31, 1950, King Island sold 825 tons of scheelite concentrates of an average assay of 66.92% WO_3. Actual production for the year was only 776 tons. Whether the projected production increase can be carried out will largely depend on priorities which the company can secure for plant, building materials and labor. Unless rainfall increases, the company will again be faced with a shortage of water for the milling. Construction of a river storage dam was started too late for the 1950 winter rains. A new re-treatment plant is nearly ready to operate.

NEW SOUTH WALES

★**Many small tin producers** are reported to have abandoned their claims to go looking for tungsten ores. The reason is that the tin price is pegged

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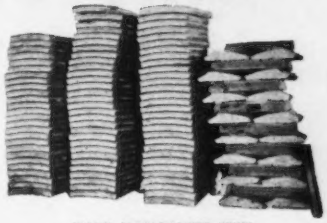

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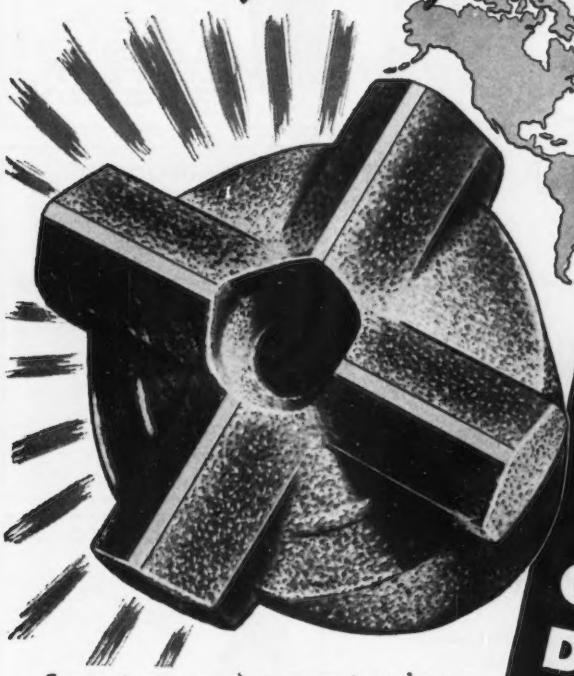

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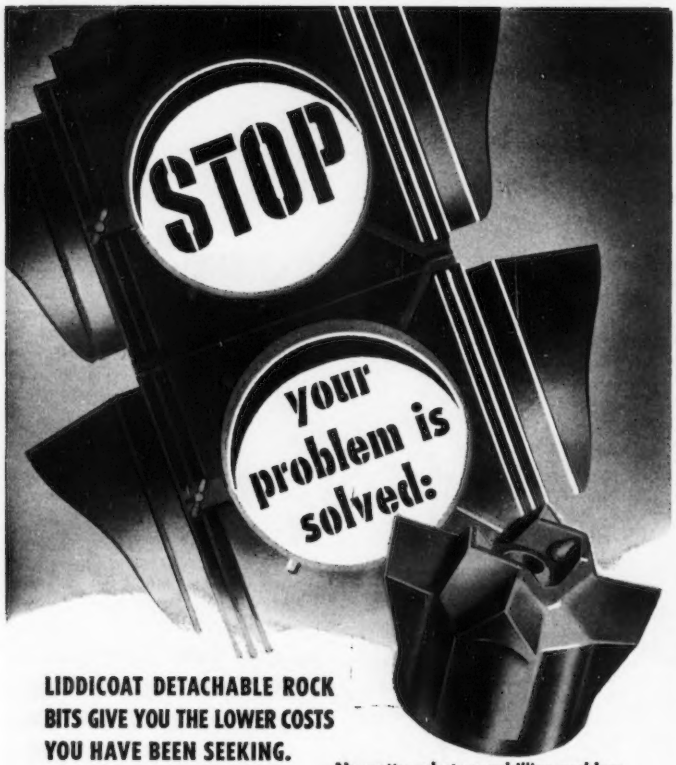

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Australia *(Continued)*

at 84 c. per lb. and exports are prohibited. Producers are thus compelled to sell the metal at considerably less than the ruling international price.

★A new company, **Scheelite Consolidated N. L.**, is in process of formation with a capital stock of £50,000. It will operate at Frogmore, near Yass. The orebodies are quartz veins in slate, dipping at about 60 deg. The main vein has an outcrop length of 800 ft. The ore shoot is almost vertical and has a consistent length of about 530 ft. from the surface to the bottom (No. 5) level at 320 ft. below the collar of the main shaft of the Phoenix mine. Where mined, the average width of the vein was nearly 10 in., but it was necessary to stope to a width of about 3 to 4 ft. Approximately 19,200 tons of ore has been treated for a total production of 460 tons of mixed wolfram and scheelite concentrates. This represents a recoverable grade of 1.74 per cent WO_3.

QUEENSLAND

★**The tungsten rush** is on in this state also. It is focused on Wolfram Camp, 15 miles from Dimbulah. An unused battery is doing the crushing. Most of Queensland's production to the end of 1948, 12,331 tons of wolfram, 1,800 tons of wolfram-bismuth, and 96 tons of scheelite, representing about half of Australia's cumulative output, came from the Chillagoe-Herberton district led by Wolfram Camp.

PAPUA-NEW GUINEA

★The Department of External Territories has submitted to the General Assembly for the United Nations its third report on the administration of the Australian trusteeship **territory of New Guinea.** At the same time it has released a report on the adjoining territory of Papua. Both reports are for the year ended June 30, 1949.

★According to the report on New Guinea, **gold-silver ores** are the only mineral resources which have been commercially developed to any extent. However, geological investigations have revealed the occurrence of coal, iron, copper, silver-lead ores, osmiridium and platinum. Mining activities were confined mainly to the gold-bearing ores in the Morobe district and, to a lesser extent, in the Sepik and Kieta districts. **The Bulolo Gold Dredging Company, Ltd.** continued prospecting in an area around Korosameri in the Sepik district. A license to prospect an area of 6,960 hectares in the lower Watut River in the Morobe district was granted, and applications for another 7,032 hectares are under consideration.

★In Papua, **gold and manganese** are the only minerals commercially exploited, but an intensive drilling program is in progress to locate oil reservoirs. Gold exports were valued £4,077 in 1946-47, £2,299 in 1947-48 and £264 in 1948-49. Exports of manganese ore increased in value from £641 in 1946-47 to £6,103 in 1948-49. The decline in gold exports was due to collapse of underground workings and displacement of mining and milling machinery as a result of landslides and floods. The more important gold-mining companies in Papua are operating on Misima Island, 160 miles due east of Samarai. The largest company here is Cuthbert's Misima Gold Mine Ltd. Other operators on the island are Quartz Investments Ltd., Mararoa Gold Mines Ltd., Gold Mines of Papua Ltd., and Gordon's Misima N. L.

★**In the Astrolabe field,** on the mainland, Mandated Alluvials N. L. made steady progress with its rehabilitation program. Collapsed mine workings were reconditioned, the smelter restored and other machinery installed. To test the nature and extent of the orebody, a geophysical survey of the leases was commenced. On its completion the company intends to carry out an extensive diamond drilling program. Some alluvial gold is won in the Milne Bay area by natives employing simple box and dish methods.

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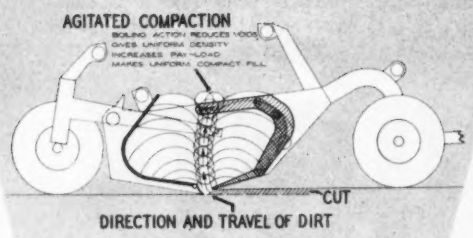
1008

It's BOILING ACTION that helps Bucyrus-Erie Scrapers Load FAST and FULL



CAPACITIES

S-Type
4 to 10 cu. yd.
B-Type
16 and 22 cu. yd.

HERE'S WHAT BOILING ACTION IS

Bucyrus-Erie Scrapers bite into dirt sharply and cleanly . . . funnel it up through the center of the load . . . spread it out evenly on top. Because of this action, the bowl fills quickly and completely by the most direct route — through the middle. As the dirt boils up, it is churned thoroughly, breaks down into small pieces to minimize waste air space.

WHAT IT MEANS TO YOU

You load faster. You load more dirt. You do both on shorter runs. Combine these time-saving and payload-boosting advantages with Bucyrus-Erie's fast hauling, swift dumping and rapid turning and you get unmatched scraper performance.

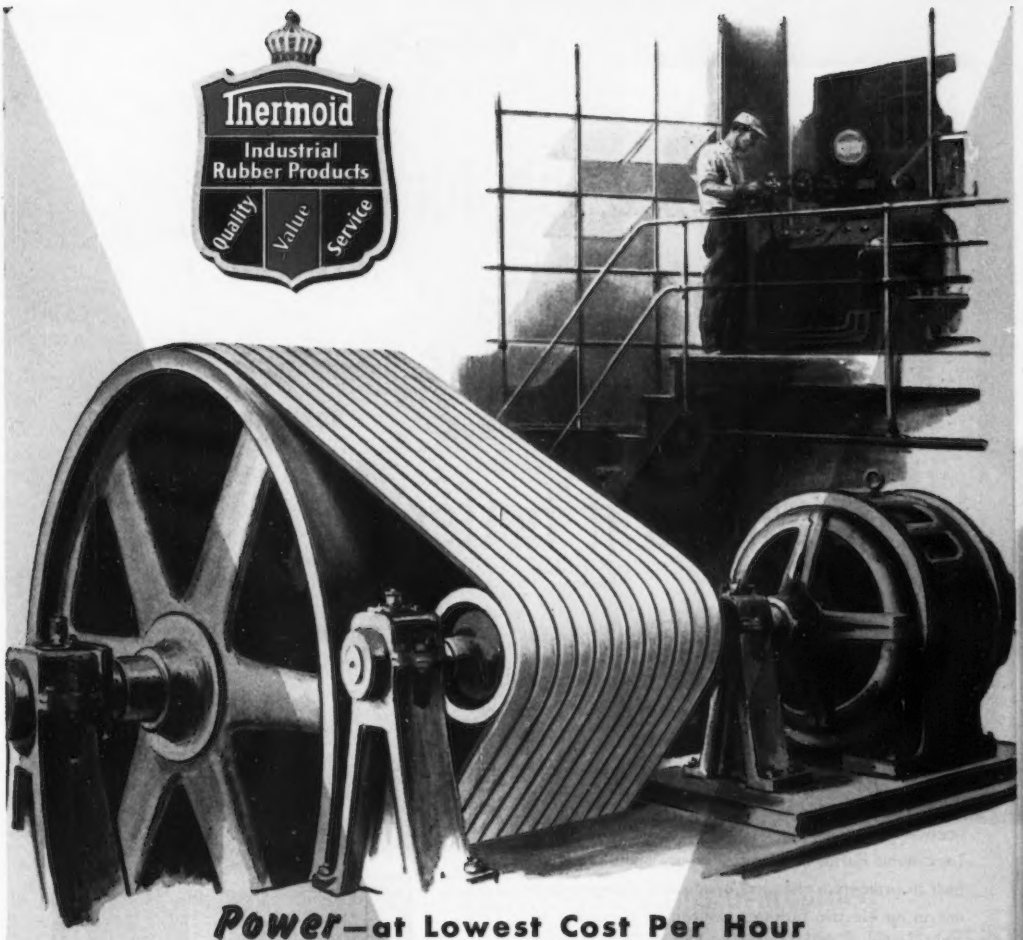
273T81

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN

for Complete Information on the BIG RED TEAM

See Your INTERNATIONAL Industrial Tractor Distributor

Thermoid
Industrial Rubber Products
Quality Value Service



Power—at Lowest Cost Per Hour with Thermoid Multi-V Belts

Thermoid Multi-V Belts are pre-stretched to insure maximum power transmission without adjustment. They are constructed for flexibility and ability to absorb repeated shock loads . . . thoroughly impregnated with special rubber compounds to withstand moisture and abrasion, resulting in longer belt life.

Thermoid Multi-V Belts are available in matched sets—uniform in size and cross section. Their longer life and non-slip performance add up to "Power—at the lowest cost per hour."

Your Thermoid Distributor can help you with your power belting problems—whether you need Multi-V, F.H.P. or flat transmission belts. For unusual belt problems, a Thermoid Field Representative is always available to give you the benefit of his experience.

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Thermoid

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

SMELTING ORE

NON-METALLIC MELTING

FERRO ALLOYS

NON-FERROUS REFINING

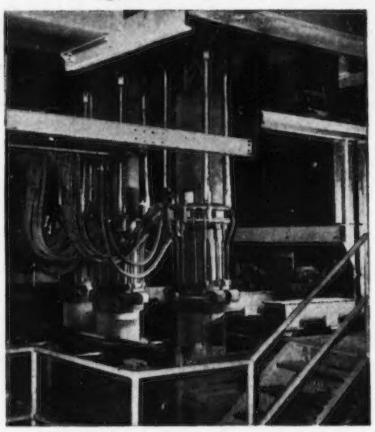
PHOSPHOROUS FOR FERTILIZERS

If it's a job for an Electric Furnace, *Lectromelt* will do it better

Throughout the past 34 years, Lectromelt engineers have designed and built many furnaces for various branches of the metallurgical and chemical industries. Today, with over a million and a half kilowatts of installed capacity as evidence, Lectromelt Furnace equipment is recognized as being outstanding for all types of smelting, refining and melting furnaces.

Problems in the reduction of ores and concentrates have been solved, then put on a production basis with full-scale Lectromelt Furnaces. Practically any operation that requires heat to promote a chemical or physical change can be carried out in an electric furnace. Lectromelt engineers have been conducting continuing research on electrothermic reductions, so they are able to advise you on many of those operations.

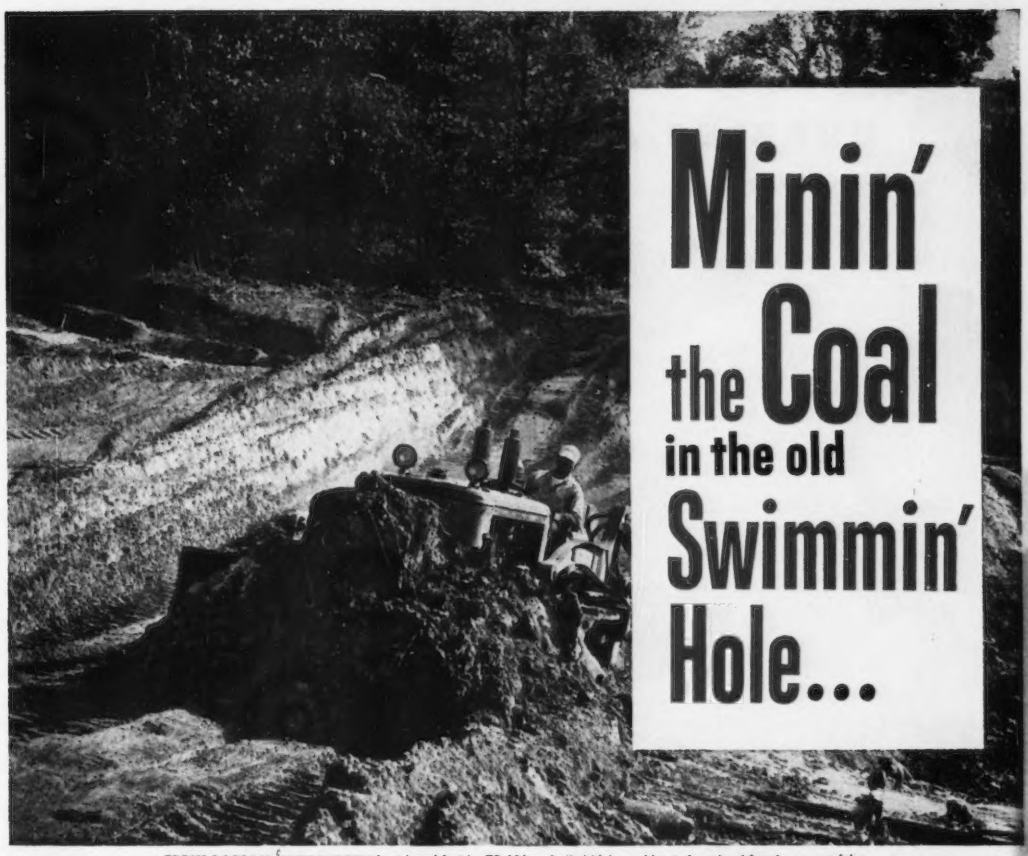
Whether you're expanding accepted processes or developing something new, Lectromelt engineers have the know-how that will probably prove a short-cut. Tell your problem to Pittsburgh Lectromelt Furnace Corporation, 322 32nd Street, Pittsburgh 30, Pennsylvania.



2,000-KVA Lectromelt Reduction Furnace.

Manufactured in ... CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 ... ENGLAND: Birlec, Ltd., Birmingham ... SWEDEN: Birlec, Elektkougnar A/B, Stockholm ... AUSTRALIA: Birlec, Ltd., Sydney ... FRANCE: Stein et Roubaix, Paris ... BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege ... SPAIN: General Electrica Espanola, Bilbao ... ITALY: Forni Stein, Genoa.

WHEN YOU MELT... MOORE RAPID *Lectromelt*



Minin' the Coal in the old Swimmin' Hole...

CREEK BOTTOM OVERBURDEN is stripped fast by TD-18A and piled high on sides to form bowl for eleven-acre lake.

How an International TD-18A strips overburden in creek bottom coal mine, later to become a lake resort

They moved a creek to get the coal. And soon there'll be a new lake near Harrisburg, Missouri, compliments of Taylor Barnes, mine operator.

While creek flowage is pumped through a by-pass, a TD-18A strips overburden from coal and piles it high on the sides of the creek bed to form a bowl. When pit is abandoned, the creek will flood the bowl to form an eleven-acre lake.

Taylor Barnes sings the praises of the TD-18A: "We sure had our eyes opened by its performance, and the distributor service behind it."

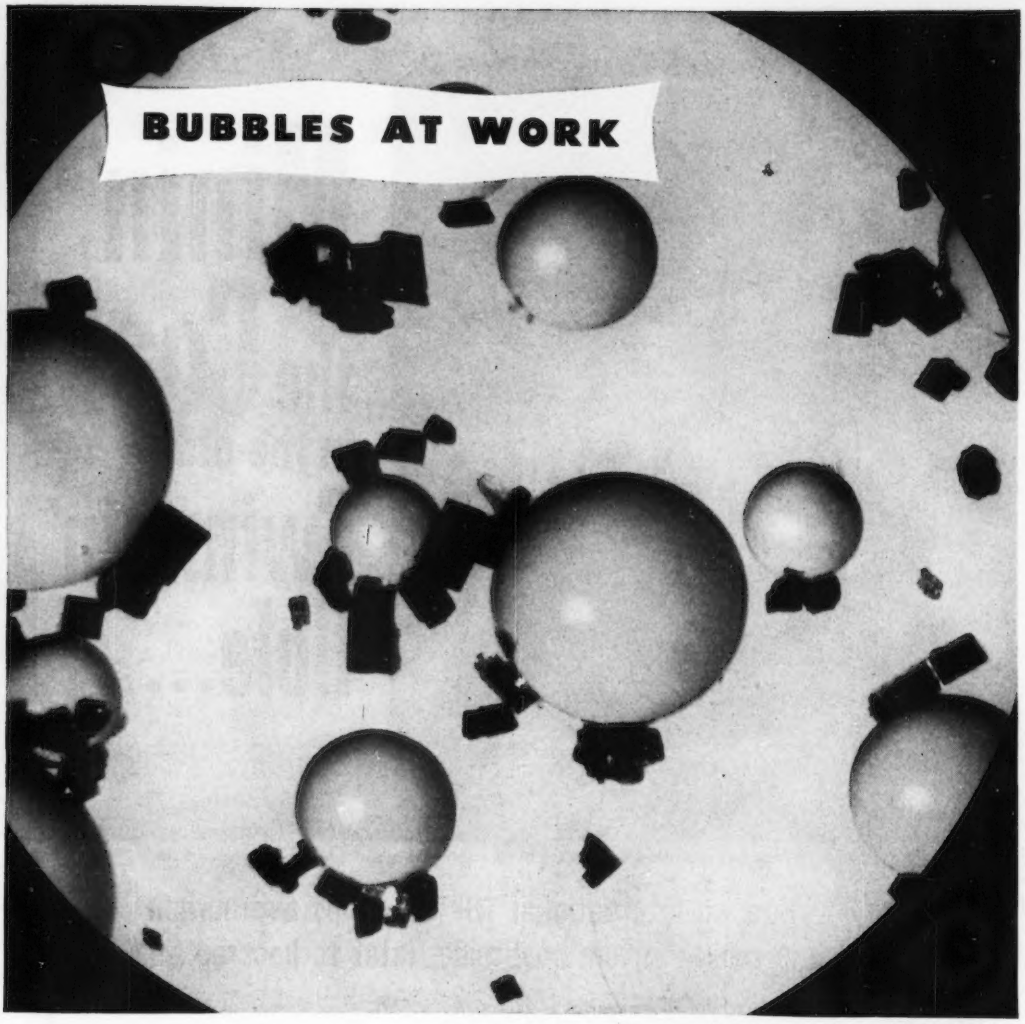
Isn't it time you saw your International Industrial Distributor? His service department is fully stocked with International parts, and his factory-trained mechanics will keep your Internationals on the job and making money for years to come.

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL

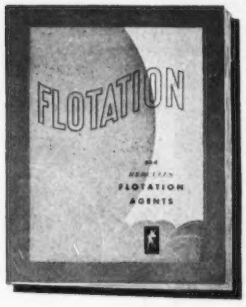
POWER THAT PAYS

BOWL FOR SWIMMIN' HOLE takes shape as International crawler exposes coal underlying creek bed in profitable mining operation.



Photomicrograph greatly enlarged, by H. Rush Spedden

To help step-up flotation recoveries at low cost, Hercules has developed a number of frothers and collectors. Yarmor® F Pine Oil has been a standard of quality among pine oil frothers since the early 1920's. RADA (Hercules' Rosin Amine D Acetate) is a siliceous mineral collector that has good solubility and is easy to handle. It is used in the commercial flotation of several nonmetallic ores. These and other Hercules products are described in a 16-page technical booklet, "Flotation and Hercules Flotation Agents." This booklet also contains many formulas useful in the operation and control of modern ore-dressing mills. *Send for your copy.*



HERCULES POWDER COMPANY *933 King St., Wilmington, Delaware*

HERCULES Flotation Agents

NM51-1

M·S·A Lamp Service

Keeps your Lighting in "Brilliant" health

Delivery of your lamps is only the beginning of M.S.A. Service.

Your M.S.A. man gives helpful tips on economical lamp-house layout.

He trains lamp-house attendant in the best maintenance methods.

He prepares a balanced inventory of parts for repair stocks.

He makes regular checks, to keep the parts stock complete.

Your M.S.A. man is on 24-hour call, to help in any emergency.

When you outfit your miners with Edison equipment under M.S.A.'s lamp maintenance plan, YOU HAVE EFFECTIVE *LIGHTING*. That's what you really want—and M.S.A. sees to it that that's what you get!

Making good on this assignment calls for something extra in lamp quality and dependability. Edison lamps have every modern improvement that a continuing research program, and the greatest care and craftsmanship in manufacture can provide. Production depends on adequate and unfailing light—and reliability standards are set up accordingly.

Making good on this assignment calls for something extra in service, too. The M.S.A. man makes your lighting his business. Your all-important parts stock becomes his direct responsibility. He checks the inventory at the service bench like the one illustrated above on every trip, to be sure that sufficient maintenance parts are available to keep every lamp in service at all times. And between his periodical visits, he is always available for emergency help when needed.

If you are not now using M.S.A. lamp service, we will be glad to tell you all about it.

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STS. • PITTSBURGH 8, PA.

At Your Service

54 BRANCH OFFICES IN THE UNITED STATES AND CANADA

LIMA

CAPACITIES
CRANES-Up to 110 TONS
SHOVELS-¾ Yds. to 6 Yds.
DRAGLINES-Variable

LIMA Rubber Mounted TRUCK CRANES in 20 and 35 Tons Capacity

LIMA rubber-mounted cranes offer you the added benefits of greater mobility, less travel time and better maneuverability. Rotating assemblies have the same basic features as corresponding crawler machines, with alterations adapting them to truck or wheel mounting. With outriggers supported, they provide extra capacity; are ideal for operations requiring constant movement around the job, for small scattered jobs, or remotely located.

FIRST BY COMPARISON

LIMA Shovels, Cranes and Draglines have always stood alone by comparison because they are engineered and built to give every user the best value for his investment. Their high productivity, versatility and money-saving features keep down-time to a minimum and output at a maximum.

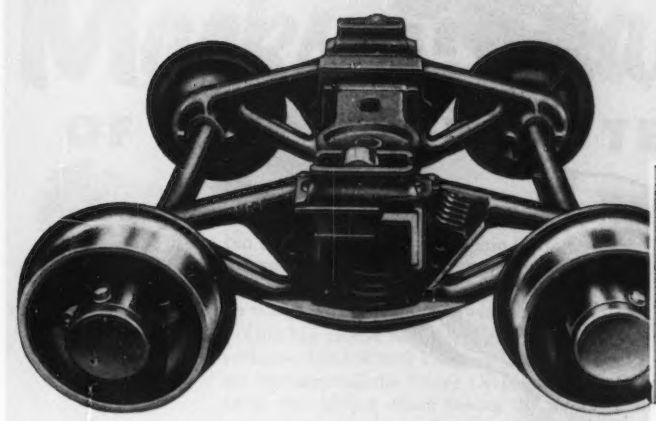
Investigate LIMA shovels, cranes and draglines. See for yourself how they help you get greater production at lower cost. *Baldwin-Lima-Hamilton Corporation, Lima-Hamilton Division, Lima, Ohio, U. S. A.*

BALDWIN BLH LIMA-HAMILTON

T2101

SALES AGENTS IN PRINCIPAL CITIES OF THE WORLD

BALDWIN-LIMA-HAMILTON

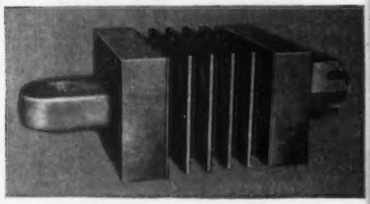


The NC-1 Truck climaxes 20 years of intensive research, providing (through the friction control mechanism shown in cutaway) protection to equipment, roadbed and lading with maximum wear life.

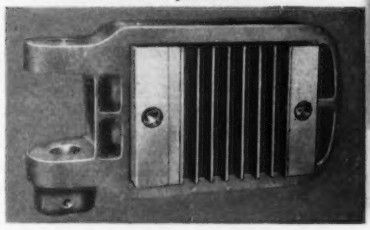
Willison Automatic Couplers save time with maximum safety . . . can be coupled at either end of car or locomotive . . . require no manual assistance. Close coupling eliminates damaging slack, permits high speeds with maximum stability.

NATIONAL *products cut per ton costs!*

Latest example of National's pioneering in better equipment is the NC-1 Truck. Its sweeping advancements over conventional trucks include long soft springs, a friction mechanism—controlling vertical and transverse oscillations, a cast one-piece bolster with large lubricated center connection, and automatic frame alignment. The NC-1 has been designed with the same factor of safety that is required by the Association of American Railroads for full size railroad trucks, and embodies the same features which A.A.R. tests have shown to be essential to produce good riding qualities. For the best in profitable equipment, *always specify National products.*



National M-230 Rubber-Cushioned Draft Gear for cars operating through rotary dump. Soft initial-action, high-capacity rubber pads provide maximum impact protection, lengthen equipment life. Available in a range of capacities and design variations to fit individual requirements.



M-225 Rubber-Cushioned Draft Gear for locomotives and large capacity cars not required to operate through rotary dump. Maximum protection in minimum space.

A-3863

Be sure to visit Booth 1618 at the American Mining Congress 1951 Coal Convention and Exposition • May 14-17 • Cleveland, Ohio

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

WILLISON AUTOMATIC COUPLERS • NC-1 TRUCKS • DRAFT GEARS • NACO STEEL WHEELS

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY Est. 1868

How much Valuable Dust can you Economically Recover?

Unique advantages of Buell Equipment couples Peak Efficiency with Peak Economy in Valuable Dust Recovery!

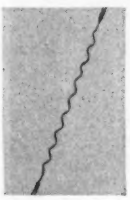
In the recovery of valuable dust, a line must be drawn between the limits of peak efficiency and practical economy.

For, as you know, there is a degree of efficiency, beyond which, recovery becomes economically unsound.

Buell dust collection equipment was designed with this premise in mind. Its specific operating advantages permit dust recovery efficiencies beyond those of ordinary collection devices.

Experienced Buell engineers are qualified to show you how to economically increase your valuable dust collection efficiency with either a Buell 'SF' Electric Precipitator, a Buell mechanical collector, or a combination system utilizing both. They will be glad to discuss your problem with you. Write for an appointment today, or ask for the Buell catalog. Buell Engineering Company, 70 Pine St., Suite 5035, New York 5, N. Y.

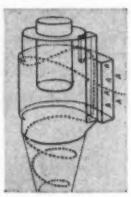
Only Buell Incorporates these Efficiency Building Advantages



Buell 'SF' Electric Precipitator: StediFLOW Dust Fall assured through carefully timed, continuous-cycle rapping of plates in line.

Exclusive self-tensioned Spiralectrodes for greater corona emission without danger of flash-over.

Buell van Tongeren Cyclone: Exclusive van Tongeren "shave-off" principle of Buell Cyclones permits sustained efficiencies, substantially higher than those of any other kind of mechanical collection.



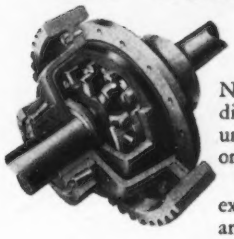
ELECTRIC CYCLONIC

buell

Engineered Efficiency in **Dust Recovery**

Macks ARE Masters

OF THE TOUGHEST TERRAIN



No matter how tough the going... under the worst of weather conditions... through slippery mire or shifting sand... or over rutted, uneven ground — big SUPER MACK trucks keep the payloads moving on time... at less cost and with less absenteeism.

One big reason why Mack trucks lick the toughest terrain is the exclusive Mack Power Divider. Where unequal tractive requirements are encountered, the Power Divider differential distributes torque to favor the driving wheel having the most traction, thus eliminating power dissipation in useless wheel slippage.

Mack's exclusive Power Divider combines with numerous other outstanding Mack features to give you the power, strength, traction and easy maintenance so necessary for dependable, uninterrupted service on the job. Your nearest Mack branch or distributor will give you complete details. You'll find it's a story worth listening to.

Whether in stripping or excavating, Model LR SUPER MACK trucks keep the loads moving—fast.

Mack TRUCKS ... *outlast them all*

Mack Trucks, Empire State Bldg., New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; Long Island City, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

"Republic Transmission Belts conserve power. Write today for full facts. There's a Republic Distributor like me close to your plant. Let him make a free analysis of your needs. His recommendations save you money."
"It's thumbs down on overuse of belt dressings which causes lumpy accumulations that result in loss of power and serious belt damage. Republic Transmission Belts have positive gripping surfaces that keep slippage at a minimum."
"To transmit reverse driving power you need strong, flexible belting. We've been using the same Republic Belt for three straight years in our lumber company and are definitely sold on Republic!"

Try Republic First...

FOR THE WORLD'S MOST EFFICIENT TRANSMISSION BELTING

You save money and help conserve rubber with pre-tested, pre-stretched Republic Transmission Belting. Whether you use endless or roll lengths in regular or oil-resisting materials, Republic Transmission Belts are built for service and efficiency.

Every belt reflects the experienced designing skill and craftsmanship that built it and your local Republic Distributor can show you how proper application and care result in outstanding performance records.

Remember, for 50 years Republic has been *the* specialist in industrial rubber. Make Republic headquarters for all your industrial rubber requirements.

INDUSTRIAL RUBBER PRODUCTS BY

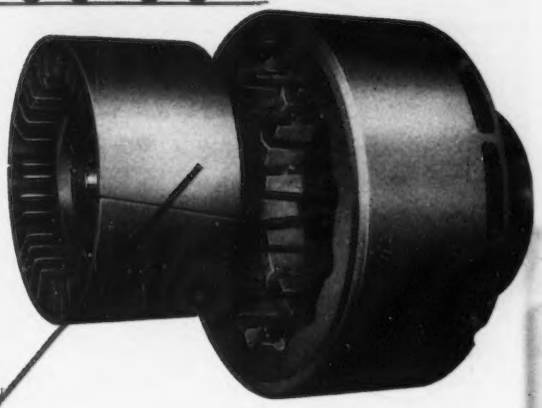
REPUBLIC RUBBER DIVISION

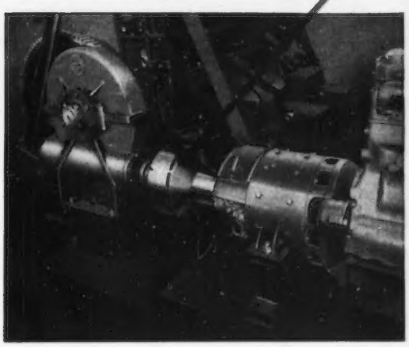
Lee Rubber & Tire Corporation

YOUNGSTOWN, OHIO

NOW STANDARD ON BROWNHOIST LOCOMOTIVE CRANES . . .

new dyna-matic clutch





142-A

For Smooth, Acceleration, and Control of Hoist, Rotating and Travel

The new, electrically operated DYNAMATIC CLUTCH, available as standard equipment only on Brownhoist Diesel Electric locomotive-cranes, provides a smooth, responsive flow of power never before possible with the usual disc or mechanical clutch for transmitting power to the machinery of a crane. The DYNAMATIC CLUTCH is essentially a driven rotor revolving on anti-friction bearings within a rotating coil energized by a small flow of current from the starting battery. The new DYNAMATIC CLUTCH has a 32-step control. Power response is steady and sensitive. Loads may be raised, lowered, or rotated smoothly and accurately without the use of mechanical brakes. Torsional impulse and vibration from the power source is completely eliminated. The DYNAMATIC CLUTCH provides a cushion between the engine and crane machinery. When clutch is fully engaged there is no appreciable slippage. Since there is no contact between the revolving field and armature, there is no friction between moving parts nor drag between the parts when the controller is in the off position — no parts need replacement other than inexpensive brushes. The new DYNAMATIC CLUTCH is one more good reason it pays to buy a BROWNHOIST.

BROWNHOIST

INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, San Francisco, Chicago, Canadian Brownhoist Ltd., Montreal Quebec. AGENCIES: Detroit, Birmingham, Houston, Los Angeles.

Your choice of COLOR

IN HARD BOILED* Safety Hats

STRONGER-THAN-STEEL FIBERGLAS

crowns offer unlimited choice of vivid, permanent colors... with color molded all the way thru the safest crowns ever built. Shock-resisting ribbed design also available in aircraft grade aluminum.

Write for Full Color Circular

SAVE MONEY . save time! One size fits all heads . . reduces inventories. Fully adjustable headband and hammock; can be changed in *six seconds*. Self-shaping and air-cushioned for comfort.

EVERYTHING BULLARD IN SAFETY *T M Reg HARD BOILED

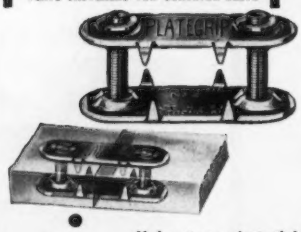
Distributors in principal cities

E. D. BULLARD COMPANY

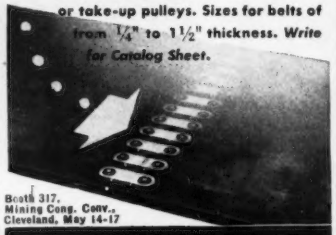
275 EIGHTH STREET, SAN FRANCISCO, CALIFORNIA

PLATEGRIP

PLATE FASTENERS FOR CONVEYOR BELTS



Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of from 1/4" to 1 1/2" thickness. *Write for Catalog Sheet.*



Booth 317, Mining Cong. Conv., Cleveland, May 14-17

ARMSTRONG BRAY & CO.

5322 Northwest Highway, CHICAGO 30, U. S. A.

after you've read this magazine

. . . and clipped pertinent ideas, articles and advertisements for reference, *please do not burn or throw it away.*

Here are two sound reasons why:

1) Wastepaper can help to swell the funds of your local Boy Scout Troop, your church or other community organization. It gets a good price these days.

2) Whether in magazine form or not, wastepaper helps to fill the increasing need for paper pulp brought on by the mobilization effort.

Collect it. Give it to your favorite organization. Chances are they have scheduled pick-ups.

NEW! CHROME-CLAD MEZURALL "10-FOOTER" TAPE-RULE No. C-9210

CHROME-CLAD BLADE
EASIER READING
LONGER WEARING
SELF-ADJUSTING HOOK
REPLACEABLE BLADES

With the new *Mezurall "10-Footer"* Tape-Rule you can save time and insure greater measuring accuracy on all types of shop work beyond the capacity of regular 6 or 8-foot Tape-Rules. Check all these features:

- **Non-glare *Chrome-Clad* satin finish blade will not crack, chip, peel, or corrode.**
- **Durable Black Markings that stand out sharply against chrome white background.**
- **Self-Adjusting End Hook that permits accurate butt-end and hook-over measuring.**
- **Replaceable blades. Patented safety catch simplifies changing blades.**
- **Improved, Heavily Plated Case with inset side plates in attractive red and white.**

A "natural" for measuring large steel sheets, plywood, linoleum and for countless other important industrial uses.

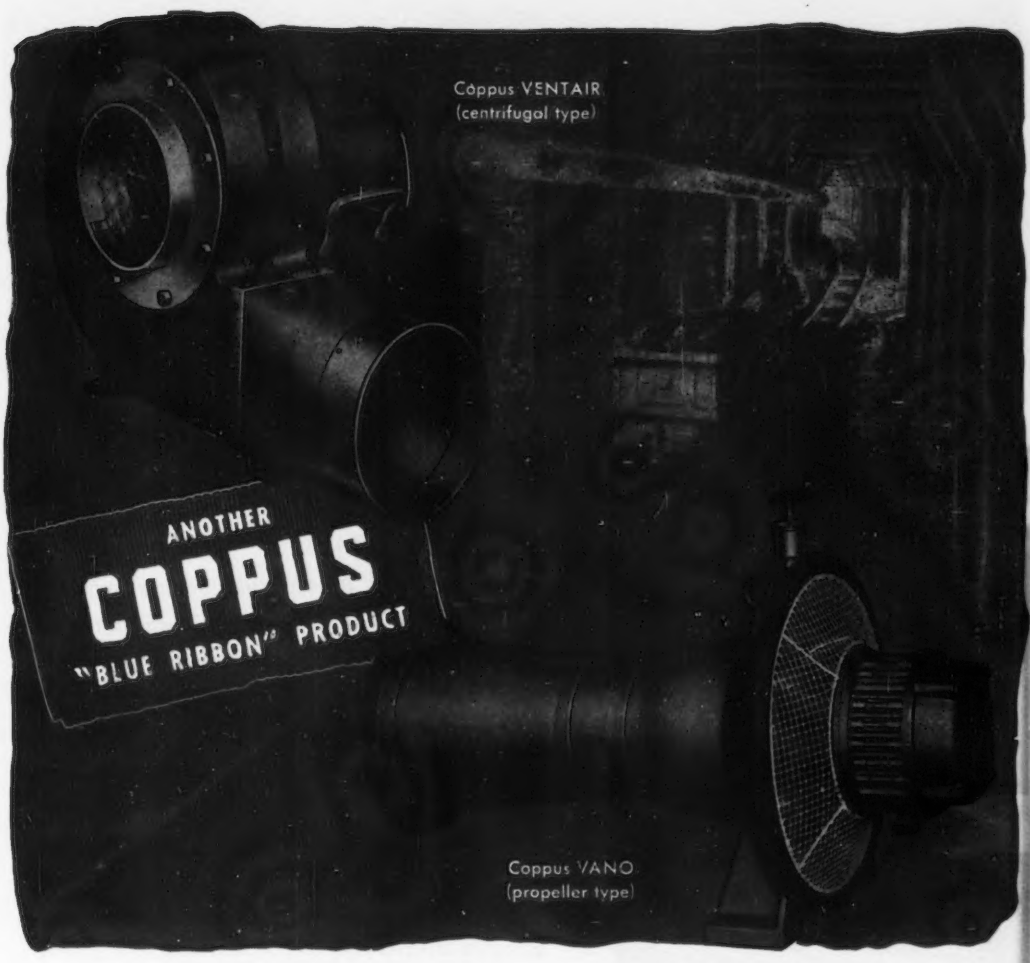
Your Supply House has them . . . specify No. C-9210 10-ft. Chrome-Clad Mezurall. Also available with nickel plated blade, specify No. 9210.

96-C

BUY LUFKIN TAPES • RULES PRECISION TOOLS

THE LUFKIN RULE CO.

SAGINAW, MICH. • New York City • Barrie, Ontario



Two Blowers . . . One Purpose:
30 to 100% More Air

Why two totally different blower types? Because the requirements of mine ventilation fall into two entirely different categories.

For high pressures, long pipe lines, use the Coppus VENTAIR (centrifugal type). For medium pressures, shorter pipe lines, the Coppus VANO (propeller type) is best. One or the other will give you more air per given power consumption than other blowers — from 30% to 100% more. Can be used as blowers or exhausters, capacities up to 90,000 CFM, with compressed air or electric motor drive.

Only Coppus makes both types. And, for quick recognition, each wears the famous "Blue Ribbon," distinguishing mark of top-quality engineering, materials and performance. This blue band is your guarantee of better mine ventilation . . . look for it.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, 282 Park Ave., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
285 Park Avenue, Worcester 2, Mass.

Please send: Bulletin 130.

Name.....

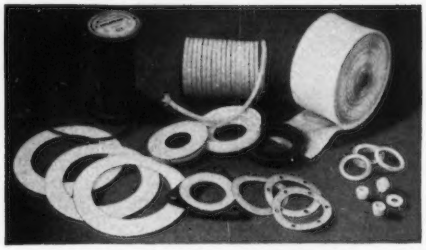
Company .....

Address.....

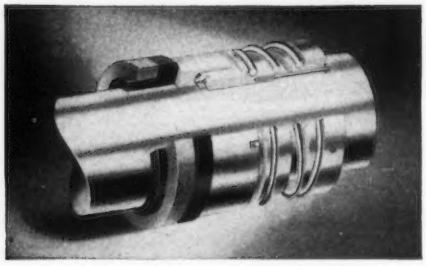
New and Improved

Packings, Gaskets and Seals

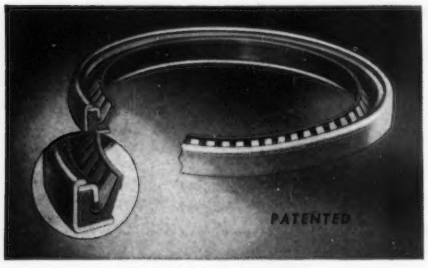
—from our expanded research program



Garlock Packings and Gaskets made of TEFLON



Garlock Mechanical Seals for Rotary Shafts



Garlock KLOZURE* *Oil Seal*

Research has brought advanced design, better materials and new uses for thousands of products in American industry.

Here in the completely equipped Garlock research laboratories we have developed new products and have improved our regular line of packings, gaskets and seals with new materials and better designs.

These new and improved Garlock products will give you superior performance and long, economical service—will help you keep down operating costs.

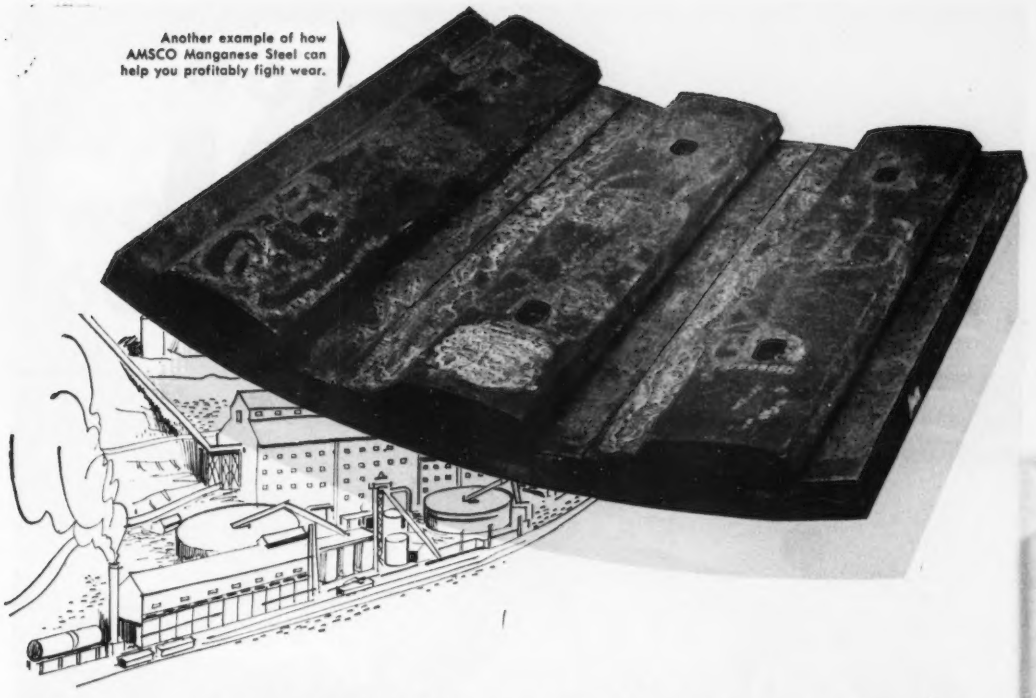
Write for folders!

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

*Reg. U. S. Pat. Off.

Garlock

Another example of how AMSCO Manganese Steel can help you profitably fight wear.



These LINERS lasted 6 times longer

How AMSCO Manganese Steel increased production . . . lowered costs per ton

A large Western mine had a problem that's all too common . . . Rod Mill Liners that lasted approximately 100,000 tons before an expensive replacement job was necessary.

In July of 1949 something new was tried. This mine installed AMSCO Liners equipped with a specially designed renewable lifter. Result? The AMSCO Liners milled 640,208 tons . . . over 6 times the tonnage of the liners formerly used. There were two important reasons for this tremendous increase in service life:

1. The liners were made of AMSCO Manganese Steel, the toughest steel known for high resistance to abrasion and impact.

2. The overlapping type AMSCO Renewable Lifters took the brunt of the load—reduced the need for replacing the more expensive liners. The lifters alone milled 340,322 tons . . . over 3 times more than the old installation!

WHEREVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .

. . . find out about longer-lasting, dollar saving Manganese Steel made by AMSCO . . . world's largest producer of Manganese Steel Castings for all industry.

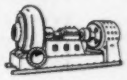
AMSCO controls impact and abrasive wear in 5 basic industrial operations:

Power Transmission

Mining and Excavating

Transportation

Crushing and Pulverizing



Materials Handling

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.

Big and Strong... Better than Ever...

MARION 111-M

Machine illustrated has Diesel power with electric swing. Also available as full Ward-Leonard Electric machine.

MARION gave the industry a new conception of excavating equipment in 1946 when the MARION 111-M was introduced. Here was a 3½-4 cu. yd. machine with all of the benefits of Diesel power PLUS all of the advantages of electric swing. Big enough for high daily yardage, yet easily moved from one job to another. Power enough to stand up to big jobs without flinching. Heavy enough to be steady on its long, wide crawlers.

Now—the MARION 111-M is bigger and stronger—better than ever. It is a thoroughly field-proven machine, piling up performance records that are truly impressive. (Write for copies of letters from 111-M owners.)

Regardless of whether you have seen the MARION 111-M before, you should see it today if a 3½-4 cu. yd. machine has a logical place in your operations. It's a rugged, heavy machine as a shovel or dragline with power and strength to spare.

The 111-M is an important new tool for heavy-duty material handling. Get the full story from your MARION representative or write to the factory for information.

MARION POWER SHOVEL COMPANY

MARION, OHIO, U.S.A.

Offices and Warehouses in all Principal Cities • Established 1884

GM DIESEL powers world's most compact 600 cfm Compressor

CONSTRUCTION—"Starts like a charm, even on the coldest morning. No time wasted in getting up to pressure. Runs a heavy pile driver with ease. We can set it out of the way with a crane and move it back to the roadway for towing in no time."

QUARRYING AND MINING—"We couldn't imagine 600 feet coming from such a slick little compressor until we saw the increased drill footage, and the ease with which it took over two FM-2 wagon drills. Good fuel economy, too."

HIGHWAY BUILDING—"Plenty of reserve—full capacity at 6,730 feet altitude. We're operating eight 55-lb. blower drills putting in 20-ft. holes on cliffsides. So easy to maneuver and work with that it's a natural for tough jobs like this."

WINNING acclaim as the world's smallest, lightest, big-capacity portable compressor, the new Ingersoll-Rand Gyro-Flow 600 is powered by a 6-cylinder General Motors Series 71 Diesel engine.

This compact, high-powered portable delivers a full 600 cubic feet of air per minute at a steady 100-lb. pressure, yet it weighs only 9,500 pounds. It is 20 to 40% lighter—and as much as 20% smaller—than other portables of comparable capacity.

Being 2-cycle, GM Diesel engines pack more power in less space. They start quickly on their own fuel, run smoothly and enable equipment to maintain rated performance at high altitudes. They're designed for ease of maintenance—no high-pressure fuel tubing—unit injectors that can be changed in a matter of minutes. And, when needed, low-cost "Factory-Engineered" parts are readily obtainable.

These modern 2-cycle Diesels are bringing new economy and efficiency to more than 500 different kinds of power equipment built by 120 manufacturers. Ask your GM Diesel distributor or write us for full details.

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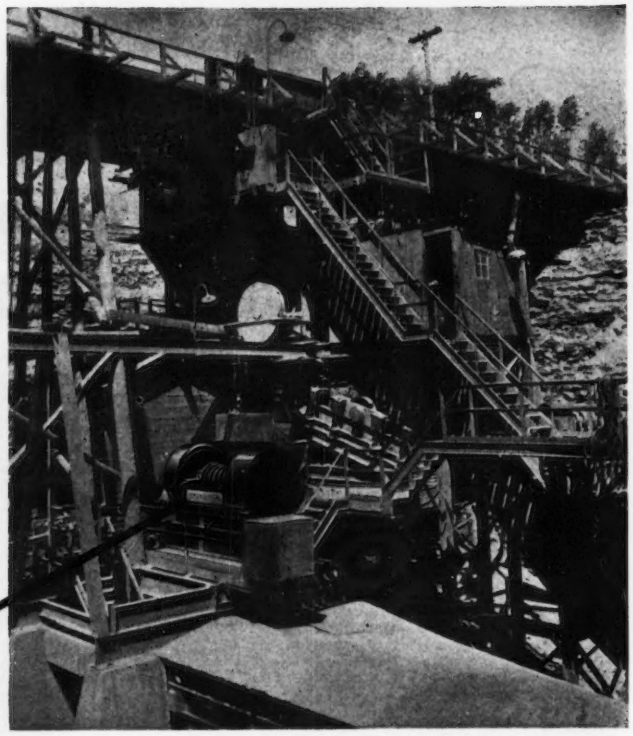
SINGLE ENGINES...*Up to 275 H.P.* **DETROIT 28, MICHIGAN** MULTIPLE UNITS...*Up to 800 H.P.*

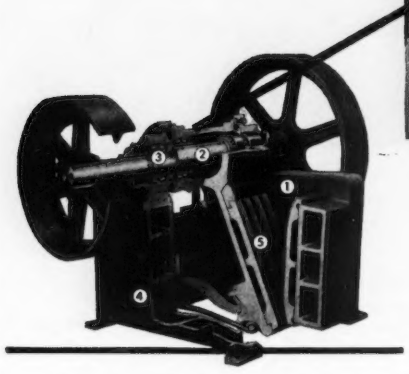
GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

Are Pioneer Jaw Crushers priced too low?





1. **BIG RECTANGULAR OPENING** takes larger chunks.
2. **OVERHEAD ECCENTRIC** forces material down and through as it is crushed, increasing output.
3. **EXCLUSIVE BEARING MOUNTING** places SKF bearings closer together than on any other anti-friction primary, reducing strain on shaft.
4. **WELDED STEEL BASE** with double wall welded box construction provides strongest base.
5. **REVERSIBLE JAW PLATES** of manganese steel shaped for maximum capacity and wear.

Illustrated is a PIONEER Jaw Crusher installed at an iron mining plant near Keewatin, Minnesota, on the Mesabi range. It might be called one of the lowest priced crushers ever sold. Yet the original invoice carried the standard PIONEER price—always competitive, but certainly not a "cut-rate" figure.

How was the price reduced? On a comprehensive cost-per-year basis. For this PIONEER Jaw Crusher (3042) has worked seven years *without a penny of expense for upkeep.* In these seven long seasons, it has handled all the 5″ oversize resulting from the screening of 2,000,000 tons of iron ore!

If you like to buy equipment on a cost-per-year basis, you will surely want to know why and how this PIONEER Crusher has performed so well. Our Jaw Crusher Catalog tells the story . . . shows the ingenious bearing mounting, the welded steel base and the many other PIONEER features that assure *higher output with lower upkeep.*

Send for catalog today. Good delivery is assured on all orders placed now.

PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota

BUY BOTH!
Higher Output, Lower Upkeep!

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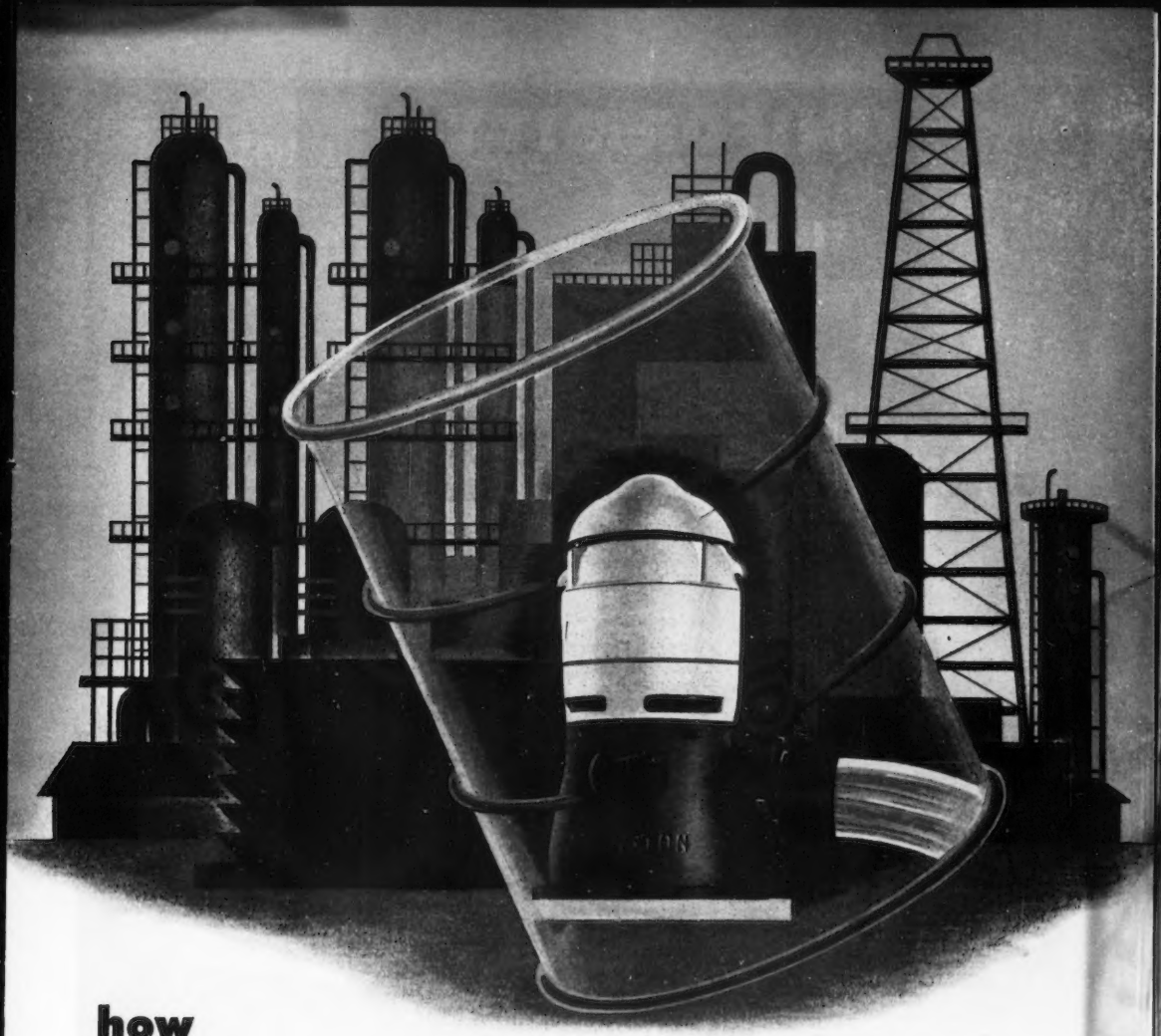

how much WATER in a barrel of oil?

770 gallons—yes, that's right! It takes 770 gallons of water to refine one barrel of lubricating oil. An oil refinery could no more operate without large quantities of water than it could without crude oil. Primary water supply, cooling water and boiler water must be pumped in the exact quantities and pressures specified at every phase of the refining process. In the mining industry, as in the oil business, where dependable water supply is imperative, you will find Johnston Turbine Pumps doing their jobs efficiently and economically. Let Johnston engineers consult with you on your water or other fluid-handling problems. Whether your installation calls for big gallonage or small, high lift or low... our engineers will demonstrate how a Johnston can save money on your pumping job. *Johnston Pump Company, 2324 East 49th Street, Los Angeles 58, California.*

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Either Oil or Water Lubricated

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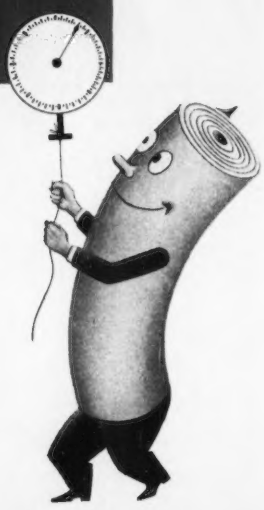
in FILTER Fabrics



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The greater uniformity of Mt. Vernon Extra means more efficient filtering – greater clarification of filtrates, more complete recovery of solids.

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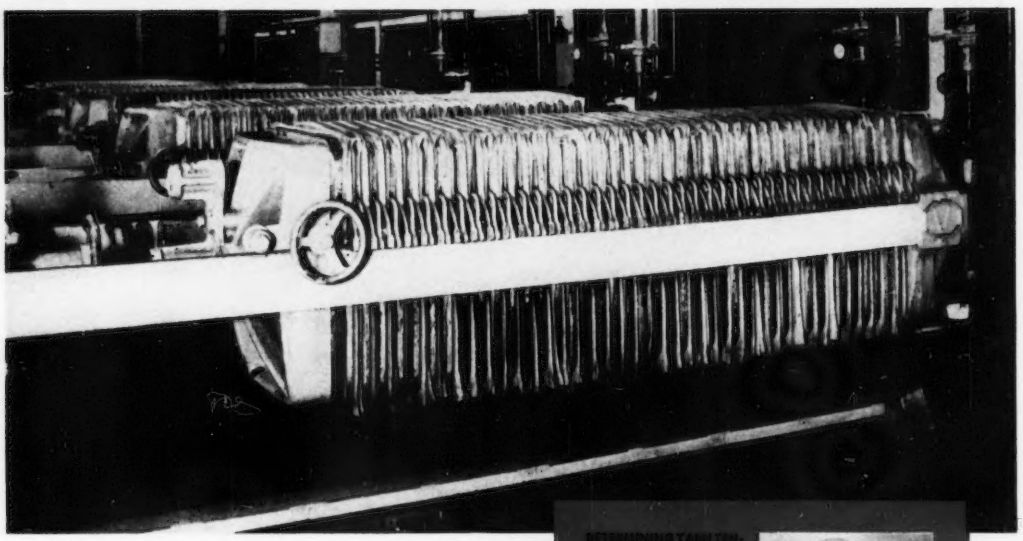
Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.



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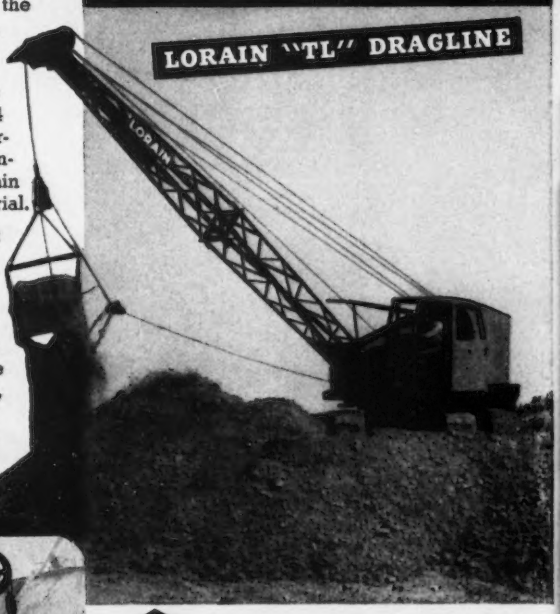
Bentonite . . or Barite . .

LORAINS Cut the Bill

AT NATIONAL LEAD!

▶ Here are two mining operations of the National Lead Company . . . one in Texas, one in Arkansas. Both jobs are Lorain equipped. But, each job called for a different material handling method. For one operation there was a need for a big 1-3/4 yd. Lorain shovel for digging hard overburden, to reach barite ore. Different conditions on the second job called for a Lorain TL Dragline to handle and cast loose material.

National Lead Company have built a fleet of 4 Lorains to meet a wide variety of work on their wide-spread operations. They chose Lorains because Lorains are available in a full range of sizes — big or small — as shovels, draglines, clams, or hoes — with crawler or rubber-tire mountings — to meet every stripping, mining and pit or quarry need. You can cut your production costs, too, with the right Lorain on your job . . . and your Thew-Lorain Distributor can show you how Lorains can fill the bill.



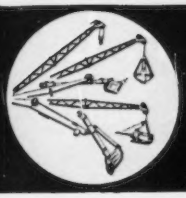
At their Marley, Texas property, *National Lead Company mine soft, porous Bentonite with a new Lorain TL-25 dragline. This is one of 4 Lorains owned by this well-known producer.*

Near Malvern, Arkansas, *National Lead's big 1-3/4 yd. Lorain-80 shovel strips tough material to reach barite which is processed and sold as Baroid for use in drilling oil wells. Here, the big Lorain is working on the floor of a 200 ft. deep pit, stripping hard shale for loading into trucks.*

THE THEW SHOVEL CO., LORAIN, OHIO

THEW **LORAIN**®

on CRAWLER or RUBBER



SHOVELS
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DRAGLINES
CLAMSHELLS
HOES

BALLMILLS

WET OR DRY GRINDING

•

OPEN OR CLOSED CIRCUIT

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ALSO AIR SWEPT FOR GRINDING AND DRYING

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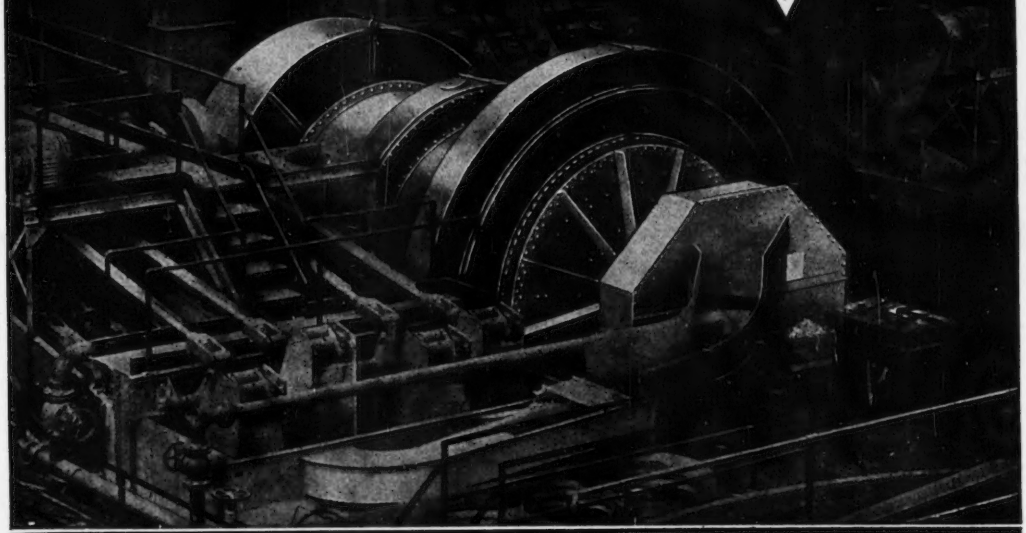

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SINCE 1895

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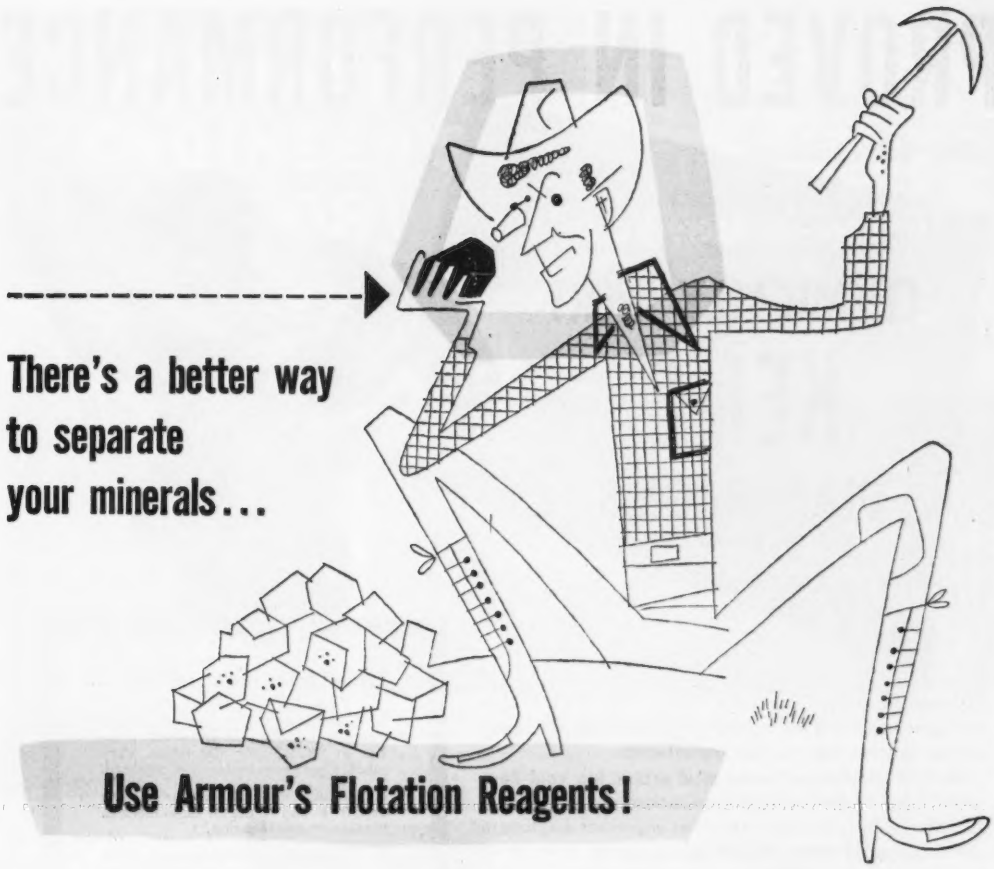


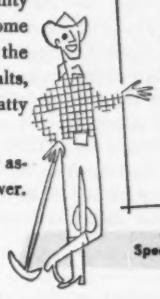
There's a better way to separate your minerals...

Use Armour's Flotation Reagents!

Froth flotation, the modern mining method, means longer life, greater productivity and more economical separations for your mine. Yields of a given ore are raised by: (1) making separations once considered economically impossible, (2) making higher grade concentrates possible, (3) recovering more than one concentrate and (4) concentrating minerals lost in tailings.

Vital to profitable flotation is the uniform high quality of the reagents. The pioneering Armour Chemical Division produces a wide range of quality chemical reagents—both anionic and cationic. In the anionic category come Armour's fractionally-distilled fatty acids. The cationic group includes the high molecular weight aliphatic amines and their water soluble amine salts, as well as quaternary ammonium salts. Armour manufactures these fatty acids and fatty acid derivatives under the strictest chemical control.

If you have a separation problem involving the listed ores and their associated minerals, Armour's technical service staff may provide the answer. Write today for more information.



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Pat. App. For

Grinnell-Saunders Diaphragm Valves with KEL-F Diaphragms are living up to every promise made for them! At the right are reports from typical users.

KEL-F's resistance to chemical action, low cold flow, wide range of temperature application and exceptional flex life combine to make it the most important diaphragm development in years. KEL-F is chemically inert to all organic acids and alkalies in all concentrations. It withstands chlorinated aliphatic and aromatic compounds, concentrated nitric, chromic, hydrofluoric and sulphuric acids and most solvents which readily attack rubber and previous synthetic diaphragm materials.

While KEL-F is tough and flexible, it is not resilient. To provide resiliency for proper closure of the valve and to provide added support for the KEL-F diaphragm, it is backed with a rubber cushion. A free-floating method of attachment to the compressor assures an even closing pressure on the entire surface of the weir. A tube nut which floats as the rubber cushion presses down in closing the valve, eliminates excessive pressure on the diaphragm stud. The rubber cushions the closing force, thereby reducing wear and cutting action on the diaphragm. In accelerated tests, a 2-inch valve with a KEL-F diaphragm withstood over 80,000 closures, drop tight, against 80 pounds of air under water with no leakage and no visible signs of wear. Write for complete information.

Typical performance reports . . .

1. Chlorine and HCl gas with small amounts of acetic acid and acetyl chloride at 302° F. for 900 hours. Very much superior to material it replaced.
2. Mixed aromatic and ketone solvents at 230° F. and 10 psi for three months. No sign of deterioration.
3. Chlorinated organic chemical at 158 to 194° F. and 30 to 40 psi for nine months. No failure, no shutdown, no replacement.
4. Chromyl chloride at ambient temperature and 15 psi. Diaphragm condition good at end of thirty days' test.
5. Liquid chloral saturated with HCl at 158° F. for 408 hours. Well satisfied — have placed orders for additional diaphragms.

*"KEL-F" is the registered trade name for polytrifluorochlorethylene, an exceptionally stable thermoplastic. It is produced by the M. W. Kellogg Co.

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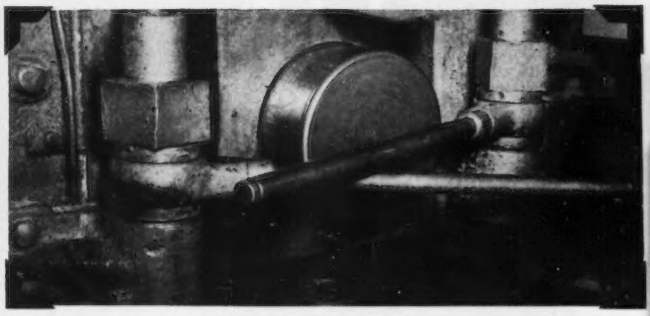
STANDARD ENGINEER'S REPORT

DATA

LUBRICANT	Calol Red Engine Oil
UNIT	Industrial bearings
LUBRICATOR	Circulating + drip-feed
CONDITIONS	High ambient temperatures & moisture
FIRM	Oregon Pulp and Paper Co., Salem, Oregon

Bearings in service 15 years in hot, moist conditions!



PLAIN BEARINGS, operating at 300 rpm in temperatures up to 175°F. (see calendar bearing above), and with water for cooling often applied directly (see photo at left), have been in service 15 years in the Salem mill of Oregon Pulp and Paper Co. They were lubricated with Calol Red Engine Oil—11 during the entire time.

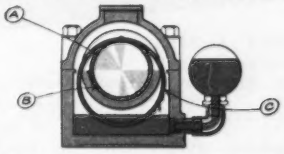
CALOL RED ENGINE OILS are used throughout this mill, even on the bearings of "glassine paper" calendars (right), which bear tremendous loads. The ability of these specially refined, stable mineral oils to provide adequate lubricant in tough conditions will reduce wear and save maintenance costs in your mill or other industrial operation. They come in several grades to meet varying conditions and requirements.

REMARKS: Standard also makes Calol Red Engine Oils X, which are specially compounded to give them high adhesive and cohesive qualities. Their ability to "carry over" and stay on surfaces reduces starting torque, friction and power consumption.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How CALOL Red Engine Oils cut industrial lubrication costs



A. Solvent-refined selected mineral oils. Exceptional stability prevents formation of deposits and assures lubrication.

B. Have low carbon residue and pour tests—provides wide range of application in external lubrication of general industrial machinery.

C. Pick up well on ring oilers, may be applied by all types of oiling systems.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

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STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

ARE HIGH CRUSHING COSTS *CUTTING INTO YOUR PROFITS?*

Still higher output is the most effective answer to today's mounting production costs. Put your tough crushing assignments up to Birdsboro-Buchanan Primary Jaw Crushers. They are engineered and constructed for fast reduction of the hardest rock and ore at minimum cost of both operation and maintenance. For an increasing number of crusher users, the suggestion to "Call in Birdsboro engineers" is becoming standard practice. Their know-how has proved extremely helpful to many firms involved in unusual or difficult crushing problems. This experience is yours for the asking.

Canadian Representative & Manufacturer JOHN INGLIS CO. LTD., TORONTO, CANADA CR-3-47-R

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For complete engineering data and specifications on the various sizes of type C Birdsboro Buchanan Crushers, write us for Bulletin #111.

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Performance pays . . .

Mill operators are judged by results. For the man who must be shown, here are some more actual test figures.

Case No. 7

Tests at a mining operation grinding sulphide copper ore.

Service: Marcy 6′ × 4½′ ball mills grinding a high sulphide ore from minus ¾″ to minus 14 mesh. Balls charged were 5″ dia.

Comparison: For many years the company used austenitic manganese steel liners in its mills. Then a change was made to high carbon chromium-molybdenum steel liners, normalized and tempered to 360 Brinell.

Liner type: Shell (barrel) liners, wave type.

Results:	Tonnage ground
Austenitic manganese steel (average)	75,000
Cr-Mo steel (average)	84,000

Case No. 8

Tests at a mining operation grinding gold-bearing quartz ore.

Service: Marcy 6′ × 7′ overflow type mill grinding ¾″ feed.

Comparison: One set of manganese steel liners was run till worn out, and followed by one set of high carbon chromium-molybdenum steel liners run under similar conditions.

Liner type: Shell (barrel) liners, wave type.

Results:	Life—Days	Tonnage Ground
Manganese steel liners	148	48,932
Cr-Mo steel liners	212	74,794

The chrome-molybdenum steel liners showed an increased tonnage ground of 53%.

Write for 32 pp reprint of an informative paper published by the Amer. Inst. of Mining and Metallurgical Engrs., giving results of wear tests on grinding ball materials—FREE!

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the greater the need for

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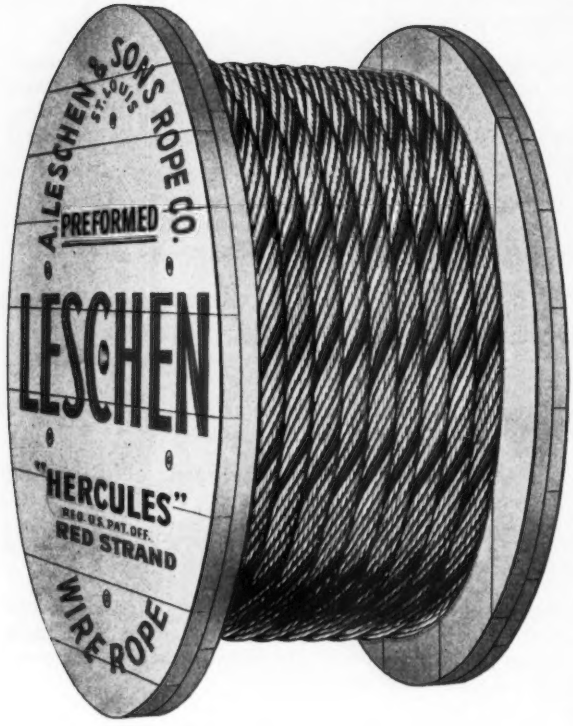
RED-STRAND
WIRE ROPE



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"HERCULES" (Red-Strand) Wire Rope was originated by Leschen in 1886 to meet the rope requirements of bigger, better material handling equipment—and tough jobs have been its proving grounds ever since.

Let the Red-Strand be *your* wire rope guide. You will find its reputation justly earned.

Round Strand or Flattened Strand – Preformed or Non-Preformed – Wire Rope Core or Fiber Core. Let us help you select the *right* rope for your job.

We Invite Your Inquiries

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to the Concentration and Purification of Such Minerals as:

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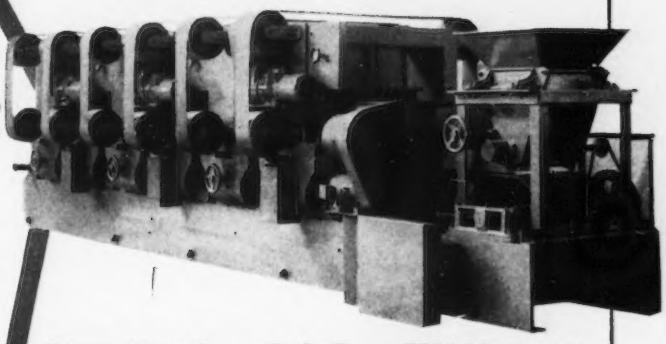
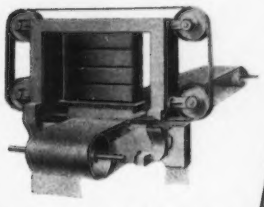
Hubnerite • Ferberite
Pyrrhotite • Manganese
and similar weakly magnetic materials





OPERATION: Material to be separated is carried on the main belt conveyor under a series of magnet and cross belt assemblies. Magnetic particles are attracted to the underside of the moving cross belt which sweeps them to the side to be separately discharged. Each magnet assembly can be adjusted to remove a desired magnetic fraction. Any number of cross belts depending on the number of materials to be separated can be provided.

Dings New Cross-Belt Type EBK Magnetic Separator Produces Highest Grade of Magnetic Concentration Obtainable

MORE selectivity and greater capacities in the concentration of magnetic ores than were heretofore possible are now obtainable with the new Dings Cross-Belt Magnetic Separator. Here are typical examples: A tungsten mining company in N. Carolina recovers 98% of a 72.2% grade WO_3 in their hubnerite ore. In McCall, Idaho, a 6 Cross Belt unit produces 550 lbs. of monazite concentrate per hour at 99.1% purity from an estimated feed of 2500-3000 lbs. of sand per hour.

Improvements

GREATER CAPACITY. New pole nose construction gives separating capacity about double that of any previous design. *Hence with this improvement, a smaller, less expensive unit will often handle requirements.* For example, under certain conditions, a new 3 Cross Belt Unit installed to concentrate manganese will do the work of a 6-belt unit of the old design.

GREATER SELECTIVITY. Each Cross Belt assembly is individually energized. The ability to make an extremely fine adjustment to each Cross Belt without affecting any other permits a degree of selective separation not possible in previous machines. A variable speed main belt drive further contributes to extreme selectivity.

EASIER MAINTENANCE. Dust sealed, anti-friction bearings are used throughout. Cross belts can now be replaced without dismantling machine.

SIMPLER OPERATION. Only one adjustment—varying the air gap—allows unit to handle various rates and qualities of feed to effect a given separation. Turning a stud, calibrated in thousandths of an inch, adjusts the air gap. Previous settings can be duplicated in seconds.

Write for full details. No obligation.

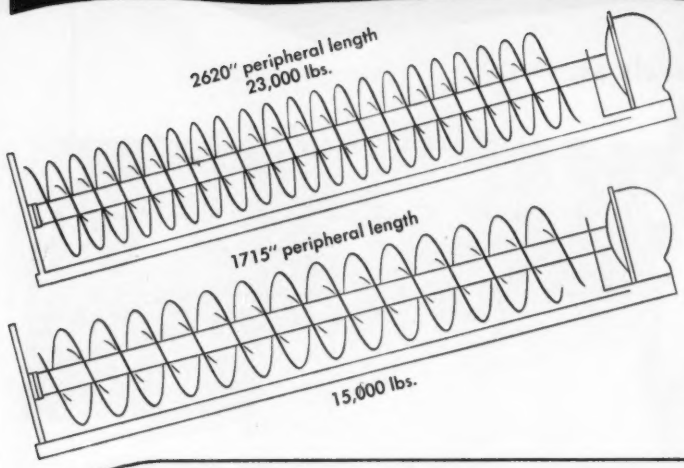
DINGS MAGNETIC SEPARATOR CO.
4716 W. Electric Ave., Milwaukee 46, Wis.

Dings Magnets

World's Largest Exclusive Builder of Magnetic Separators for all Industry

Certified Magnetic Strength

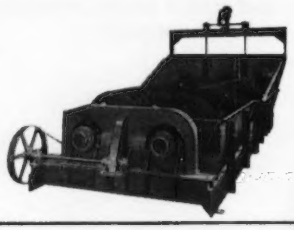
AKINS classifiers have 50% more capacity



MORE FLIGHTS

(Conveying Surface)

Per Foot in Akins Construction



The Akins Classifier uses the tightest (shortest pitch) spiral offered for mineral beneficiation. Careful comparative tests* prove that the standard Akins spiral pitch (one-half the diameter) is more efficient than spirals with longer pitches.

Because there is more steel in an Akins spiral, the initial cost is a little more, but this is quickly returned by the profits made possible by dependable steady operation at rated capacity PLUS, or 150% of the longer pitch machine. Write for details of mechanical and metallurgical advantages of Akins design and construction.**

*A report of a technical investigation on the comparison of spiral capacities at different pitches is available. Ask for Technical Investigation No. 51.

**Ask for Bulletin No. 48 for closed circuit grinding, or No. 48-S for specialized applications that may solve your particular problem.

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Canadian Locomotive Co., Ltd.....Kingston, Ontario
Head, Wrightson & Co., Ltd.....Stockton on Tees, Eng.
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Authorized Sales Agents

Edward J. Nell Co.....Manila, P.I.
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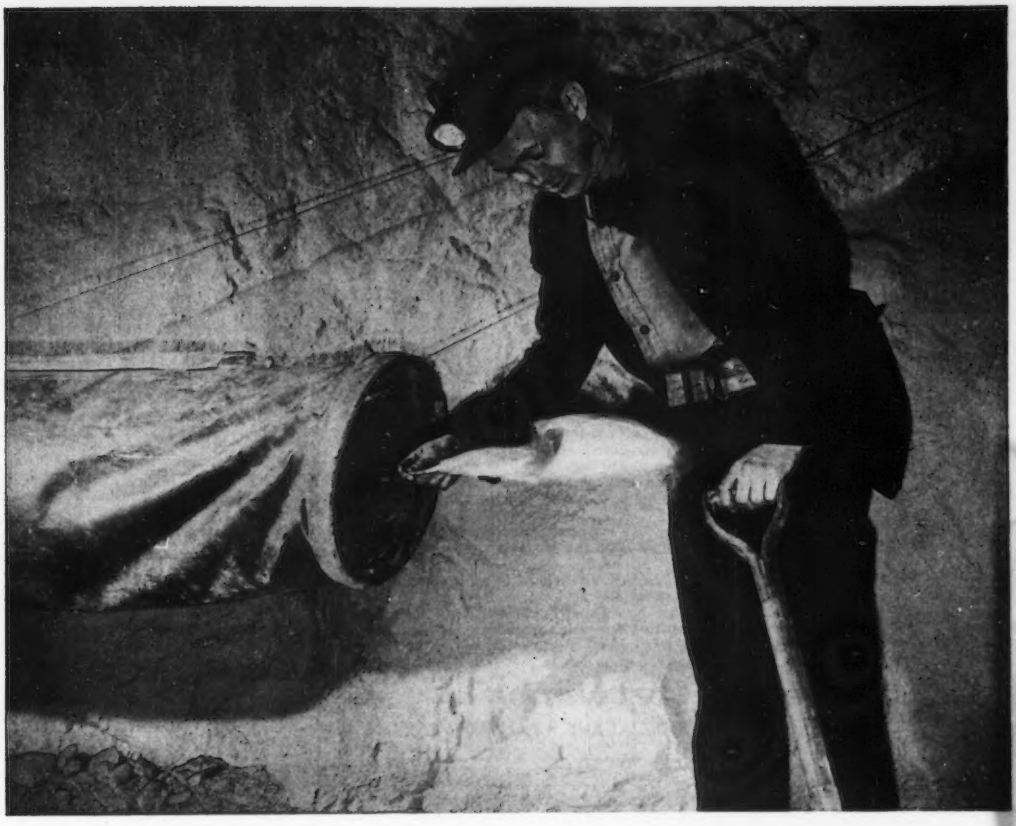
NO IMPORTANT AKINS INSTALLATION HAS EVER BEEN REPLACED BY ANY OTHER CLASSIFICATION EQUIPMENT

THE COLORADO IRON WORKS COMPANY C I W

Colorado Iron Works Co.

1624 17TH STREET DENVER 2, COLO.



Wiping the face clean in a breeze

YES, this breeze is like a handkerchief, constantly wiping heat, dust and stagnant air away from the working face. You can beat the heat and get jobs done faster when you use an auxiliary ventilating system with this "Ventube"* flexible duct coupled to a motor-driven fan of adequate capacity.

Drives out the stale, humid air. Brings in plenty of cool, fresh air. Temperatures come down. Miners no longer are slow and listless. They feel better, and their work efficiency picks up.

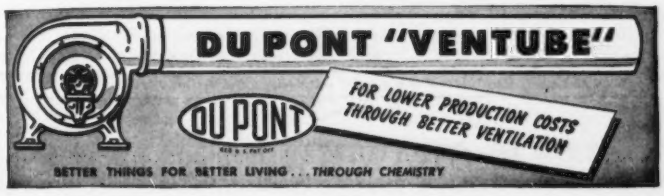
Clears face quickly after blasting. Cuts out lost time. Speeds the production cycle with more tons per hour from drifts, crosscuts, shafts, stopes, caving and top-slicing.

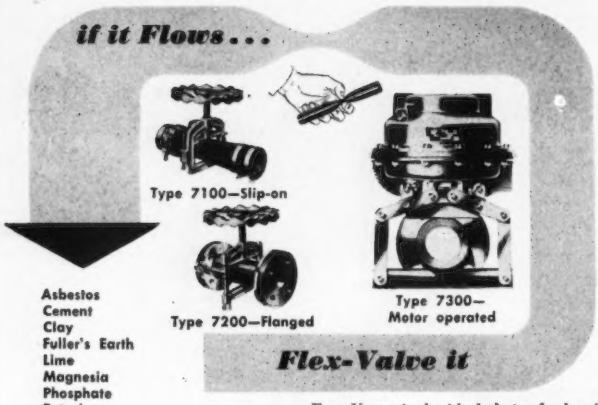
Flexible in use. Goes around curves, up and down raises. Takes up less room in openings. Directs air to the working face. Easy to move and keep up with the work.

Low initial cost (much less than rigid-type auxiliary ventilating systems). One man can easily install 100 feet per hour with patented couplings to make connections quickly.

For further information on ways to increase your mine efficiency with "Ventube," just write: E. I. du Pont de Nemours & Co. (Inc.), Fabrics Division, Fairfield, Conn.

*"VENTUBE" is Du Pont's registered trade mark for its flexible, synthetic-rubberized ventilating duct.


DU PONT "VENTUBE"
DU PONT
FOR LOWER PRODUCTION COSTS THROUGH BETTER VENTILATION
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



FLEX-VALVE is the ideal choice for handling such materials as those listed—either dry or in suspension—at temperatures up to 210 deg.

Resists both abrasion and corrosion; eliminates clogging, plugging, building up; absorbs vibration and misalignment.

Open—it's as free of obstruction as the pipe itself. Closed—it's bubble-tight and it closes tight on all of these materials.

Available in either hand or air operated types in sizes from ½ to 12 in.

Users have found FLEX-VALVE to be the low-cost solution to tough valving problems. If your present valves aren't 100% effective, take a look at this one. Catalog 455 gives details.

FLEX VALVE

Flexible Valve Corporation

7885

445 COMMERCIAL AVE. • PALISADES PARK, N. J.

How to read with your eyes open for business

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off—by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

Here's Why it Pays You to Read the Advertising

The advertising is a rich source of valuable information. In this magazine it offers you ideas and products that may well apply advantageously to your business.

Every issue is a catalog of goods, materials, and services—quickly available to you—just for the reading.

Leaders in business and industry turn to the advertising because they've discovered it helps them run their businesses more profitably.

When you read all the ads in this magazine, the chances are good that you'll get a lead that will materially help you do a better job. For example, you may find a specific piece of equipment that will be a profitable time-saver. Or a tool that will increase worker efficiency. That's why it pays to read the advertising. It's good business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

DUCTILE IRON

A Revolutionary Metallurgical Development

DUCTILE IRON is a cast ferrous product which combines the *process advantages* of cast iron with many of the *product advantages* of cast steel.

No longer in the pilot-plant stage, this new material is now produced and sold on the basis of specifications. Not only are its individual properties exceptional, but no other common engineering material provides such a combination of excellent castability and fluidity, with high strength, toughness, wear resistance, and machinability.

Actually, "ductile iron" denotes not a *single* product, but rather a family of ferrous materials characterized by graphite in the form of spheroids . . . a form controlled, in a broad sense, by small amounts of magnesium. Presence of spheroidal rather than flake graphite gives this new product a ductility that is unique among gray cast irons.

Four important types of ductile iron now being produced commercially are tabulated below.

REPRESENTATIVE MECHANICAL PROPERTIES OF COMMERCIAL HEATS OF DUCTILE IRON

	Grade	Tensile strength, psi	Yield strength, psi	Elongation per cent	BHN	Usual condition
A	90-65-02	95/105000	70/75000	2.5/5.5	225/265	As-cast
B	80-60-05	85/95000	65/70000	5.5/10.0	195/225	As-cast
C	60-45-15	65/75000	50/60000	17.0/23.0	140/180	Annealed
D	80-60-00	85/95000	65/75000	1.0/3.0	230/290	As-cast

A Pearlitic in structure. Provides good mechanical wear resistance.

B Pearlitic-ferritic in structure. Provides strength and toughness combined.

C A fully ferritic structure usually obtained by short anneal of either (A) or (B). Provides optimum machinability and maximum toughness.

D Higher phosphorous content than preceding grades, also higher manganese. Provides high strength and stiffness, but only moderate impact strength.

SOME UNIQUE PROPERTIES OF DUCTILE IRON

1. Its elastic modulus, about 25,000,000 psi, is virtually unaffected by composition or thickness . . .

2. It can provide a chilled, carbidic, abrasion-resistant surface supported by a tough ductile core. No other single material can combine these properties . . . its only counterpart being a tough material coated with a hard welded overlay.

3. As-cast ductile iron of 93,000 psi tensile strength has the same machinability rating as gray iron with a strength of 45,000 psi.

4. Annealed ductile iron can be machined at a rate 2 to 3 times that of good quality gray iron.

5. It can be satisfactorily welded.

APPLICATIONS

Automotive, agricultural implement, railroad and allied industries apply ductile iron, as-cast and heat treated, in components too numerous to detail.

Machinery, machine tools, crankshafts, pumps, compressors, valves and heavy industrial equipment such as rolls and rolling mill housings, utilize its high strength and rigidity.

In scores of engine, furnace and other parts serving at elevated temperatures, it provides oxidation and growth resistance heretofore unavailable in high carbon castings.

Other applications include paper, textile and electrical machinery, marine equipment, and pipe.

AVAILABILITY

Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing ductile cast iron under patent licenses. Request a list of available publications on ductile iron . . . mail the coupon now.

EMBLEM OF INCO SERVICE

The International Nickel Company, Inc.
Dept. EMJ, 67 Wall Street
New York 5, N. Y.

Please send me a list of publications on:

DUCTILE IRON

Name _____ Title _____

Company _____

Address _____

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With MILLER Heavy Duty Industrial Arc Welders (100 Series) you can weld faster . . . on some jobs as much as 35%, because these welders eliminate the ill effect of magnetic arc blow and permit you to use larger electrodes and higher heat values. They are designed for heavy continuous production welding—for heavy custom welding jobs and automatic welding applications . . . built to equal or exceed NEMA specifications for rated output.

Dual voltage 220/440 is regularly provided (primary winding for additional optional voltages can be furnished at no additional charge).

The three-wheel steel truck is available for Models 102, 103, 104 and 105. These welders are available in following sizes: 200, 300, 400, 500, 750, 1000, 1500 amperes (rated secondary amperes). We also manufacture welders specifically designed for the submerged arc welding process.

Call!

See the MILLER distributor in your territory today for a demonstration of MILLER Heavy Duty Industrial Arc Welders or write us for complete details.

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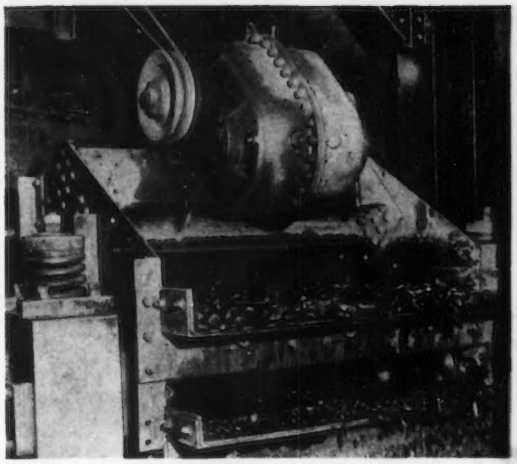
Inside Mine Drills, Drainage Holes

MOTT CORE DRILLING CO.
Huntington, W. Va.

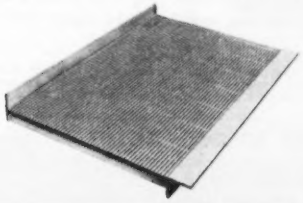
Wedge-Slot Screen in concentrator plant



In this 4′ x 8′ double-deck vibrating screen in use in one of the world's largest concentrator plants, a Hendrick Wedge-Slot Screen with type C-12 profile bars and 1/16″ slot openings is used on the lower deck.

The C-12 profile bars, 12/64ths of an inch wide, are designed for heavy duty service, and the slots extend uninterruptedly the entire length of the screen.

Write for full information on the many advantages of using Wedge-Slot Screens.



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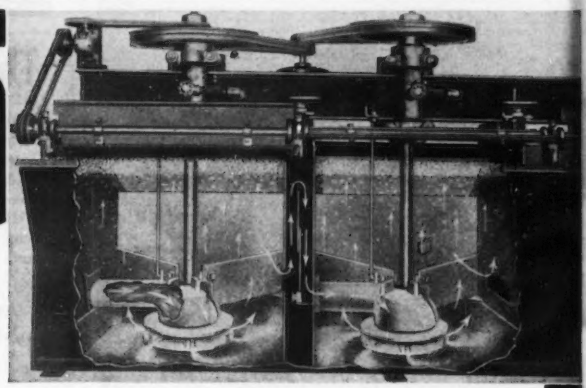
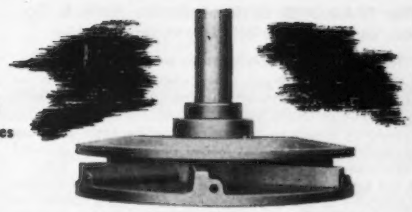
USE "JETAIR" FLOTATION FOR



- HIGH METALLURGICAL EFFICIENCY in least flotation time
- IMPROVED RECOVERY of mineral
- HIGHER GRADE concentrate
- REDUCED REAGENT requirements
- GREATER AIR COVERAGE and more effective diffusion of air into continuous masses of minute bubbles, without surges
- POSITIVE AIR CONTROL



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Supplied with or without individual cell pulp level control

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WRITE FOR LITERATURE

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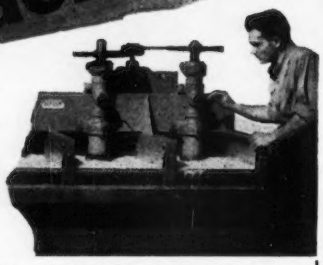
BOOTH "Cleaner Cell" FLOTATION Machine



Work With, Close
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Uniform Aeration
For All Cleaner
Cell Operations

Now Ready
For Delivery
Write for Details

BOOTH ENGINEERS
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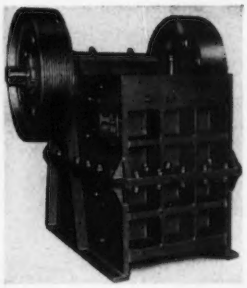
ROGERS
NEW! A Split Bed Crusher
for UNDERGROUND CRUSHING

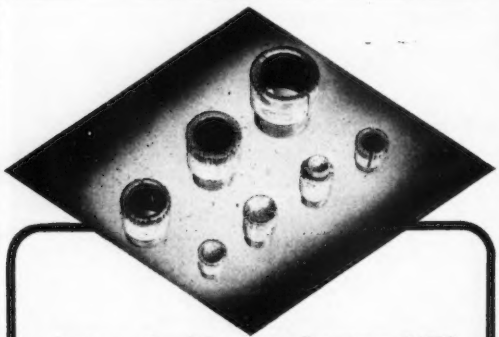


This new ROGERS Jaw Crusher "knocks down" for lowering through mine shafts. Teamed with an apron feeder it increases ore production and saves man-power at the same time.

From underground to ball mill, rely on ROGERS synchronized equipment all the way!

Dimensions and Specifications on Request. We invite you to write. Let us tell you of installations in some of the country's largest mining operations to which you may refer for performance records.

ROGERS IRON WORKS CO.



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4. The international scope of our business assures the widest selection of industrial diamonds scientifically chosen for specific uses — the best possible diamonds and matrices for every type of formation and usage—at rock bottom economies.

Informative booklets sent free on request.

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The Difference Is Yours

Money Paid for transporting water, sulfur, waste in your ores is a total loss. Take them out at their source—ship only valuable metals. Sell at a profit those metals on which you now pay penalties. Convert your complex ores to profitable income. SMELT YOUR OWN. We design plants to make your losses into profits. Submit your questions and problems to us for information.

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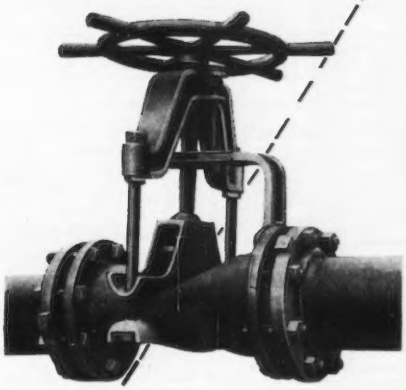
PINCH VALVES

Resist Abrasive Pulps



● Severe abrasive and corrosive pulps quickly destroys metal valves while these rubber pinch valves show little wear. They shut tight, even on solid particles. There are no packing glands, and freezing does not damage the patented hinged design sleeve. Sizes 1" to 12" available for continuous pressures up to 100-150 psi.

The Mine & Smelter Supply Co.

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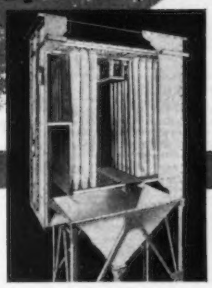
Offices in Salt Lake City, El Paso, 1775 Broadway, N.Y.C. Representatives: Canadian Vickers, Ltd., Montreal; W. R. Judson, Santiago & Lima; The Edward J. Nell Co., Manila, P. I.; The Ore & Chemical Corp., 80 Broad St., New York 4, N. Y., representatives for Continental Europe.

10 reasons why DUSTUBE collectors are more efficient and dependable



1 CUSTOM DESIGNED FOR THE METALLURGICAL INDUSTRY. Engineered for most efficient filtration with a wide selection of fabrics so that even hot and/or corrosive gases up to 275° F can be economically handled.

2 SIMPLIFIED RUGGED CONSTRUCTION. Few working parts give continuous service with the minimum maintenance for heavy duty installations in smelting, rock product and mining applications.

3 COMPLETE COLLECTION ASSURED. Change of air velocity removes heavier particles first. Uniform recoveries approaching 100% are commonplace.

4 LOW COST CLOTH TUBES. Light and compact, they are easy to store and economical to ship.

5 SIMPLE INSTALLATION AND INSPECTION. Tubes are rapidly replaced by one man working from the clean air side and condition is readily determined without removing parts. Compartments can be isolated for maintenance while balance of Collector operates.

6 LONGER CLOTH LIFE. No tension, or abrading metal contact, no stretching, no coarse dusts to wear tubes.

7 BRIDGING AND CLOGGING PREVENTED. Opening into filter bags is entirely unrestricted.

8 LOWER POWER COSTS. Ample expansion areas reduce air velocities and cut power requirements.

9 NO DUST LEAKAGE. Tubes are expanded tightly into cell plate to prevent dust leakage.

10 EFFECTIVE SHAKING. The simplified mechanical method of shaking a Dustube results in efficient, effective tube cleaning.

Write for bulletin No. 282

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BEARINGS	Tapered roller	Ball, like the rear axle on your car, takes thrust as well as radial load, absorbs punishment without service.
SHAFT	Through	Stub—saves cost, saves weight, requires less precise alignment.
LUBRICATION	Once a week with grease gun from one end—if grease congeals, bearing opposite fitting receives no grease.	Each bearing permanently lubricated and sealed. First LIFE-SEALED Idlers said have been in continuous service for 7 years without added lubrication or replacement.
COST/IDLER (typical size)	$27.00	$24.00 — 15% less
COST/1000 FT. (4 ft. spacing)	$6750.00	$5750 — $1000 saved
WEIGHT/IDLER (same size)	58 lbs.	39 lbs. — 30% less
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INSTALLATION	Careful adjustment for running clearance with fine thread and castellated nut.	Brackets need not be precisely aligned—stub shaft has flexibility of a knuckle joint.
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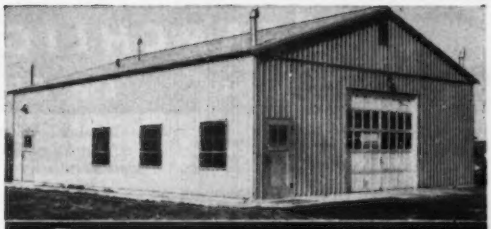

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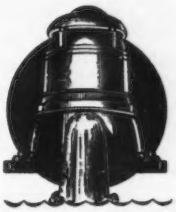

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P7942, Engineering & Mining Journal
330 West 42nd St., New York 18

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METALLURGIST-MILL Foreman, college graduate, experienced ore dresser and mill operator, standard three year contract. salary $5500, yearly plus bonus one month yearly, single status or if married single status for six months. working knowledge Spanish essential, free transportation to Bolivia by air for employees (and Wife if married), four weeks vacation yearly, free living quarters. P 9557, Engineering & Mining Journal.

WE NEED several good smelter metallurgists and chemical engineers. Also a superintendent with experience in smaller lead-zinc smelters. Steady, interesting work and good future. Must be sober and reliable. Married men preferred. Ample history and experience first letter. Small photo if possible. D. Atwood Knight & Associates, Metallurgists, Lawson, Colorado.

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POSITIONS WANTED

ENGINEER—WIDE experience mining metallurgical design construction metal and non-metal. Available for consulting or operation. Foreign service acceptable. PW 8359, Engineering & Mining Jl.

POSITIONS WANTED

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LICENSED MINING engr. E.M. and E. Met degrees. 10 yrs. engr. and supervisory experience. Pit and quarry room and pillar experience. Presently employed metallurgist and asst. to mill supt. lead-zinc mill. Age 32, married. Desire position offering additional wide experience with managerial training opportunities. PW 9487, Engineering & Mining Journal.

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330 W. 42 St., New York 18, N. Y.

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MULTIPLE TRAY
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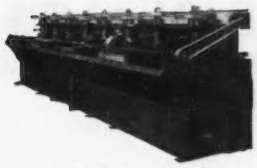

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1—#21 Denver Equipment Co. 8 cell flotation machine.
1—#7 New Morse "Jetair" hydra cell.
1—4'x6' Morse continuous drum filter.
1—36" Merrill triangular filter press.
2—2 cell Denver Equip. #21 flotation machines
1—3 cell Denver Equip. #21 flotation machines
2—6 cell Denver Equip. #21 flotation machines

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1—48"x18" Akins special classifier
3—"St. Joe" type hydraulic ore milling classifier, 10 cells, 20 spigots.

DIESEL-ELECTRIC GENERATING SETS

3—15KW Century generators driven by Waukesha-Hesselman diesels
1—30 KW Century generator driven by Buda diesel
1—74 KW G. E. generator driven by D-13000 Caterpillar diesel
1—121 KVA Fairbanks-Morse diesel generating set

GYRATORY AND CONE CRUSHERS

1—3' Symons cone crusher
1—#6 Kennedy-Van Saun gyratory crusher
1—10" Traylor "Bulldog" gyratory crusher
1—#37 Kennedy-Van Saun gyratory crusher

COMPRESSORS

1—50 CFM 5 & 4x4" Ingersoll Rand.
1—80 CFM 6" x 5" Worthington.
1—90 CFM 6" x 6" Gardner.
1—139 CFM 8⅜" x 4¼" x 5" Chicago-Pneumatic.
1—156 CFM 7" & 5¼" x 5" Gardner-Denver.
1—172 CFM 10½" x 4⅜" x 6" Rix.
1—293 CFM 12" & 6½" x 10" Ingersoll-Rand.
1—179 CFM 12" x 10" Ingersoll Rand.
1—317 CFM 7" & 5¼" x 5" Gardner-Denver.
1—382 CFM 9¾" & 5½" x 5½" Chicago-Pneumatic
1—447 CFM 14" & 7½" x 12" Ingersoll-Rand.
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1—527 CFM 9¼" & 6" x 7" Gardner-Denver.
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1—800 CFM 18" & 11" x 16" Ingersoll-Rand.
1—888 CFM 19" & 12" x 16" Ingersoll-Rand.

CONCENTRATING TABLES

2—Wilfley #6 left hand tables.
11—Deister "Plat-O" right hand tables.
6—Deister "Plat-O" left hand tables.

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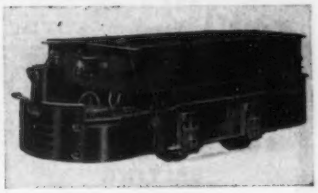
1—4' 1 disc oliver leaf filter.
2—6' 2 disc American leaf filter.
2—8'x12' Eimco drum filters.
1—#12 Sweetland 36 leaf pressure filter press.
1—18" Morse round pattern filter press.

BALL & ROD MILLS

1—30"x24" Morse new Batch mill
4—3'x2' Marcy ball mills
1—4'x4' Standard ball mill
1—5'x4' Colorado Iron Works ball mill
2—6'x36" Hardinge conical ball mills
2—8'x22" Hardinge conical pebble mills
1—#64½ Marcy ball mill
1—3'x8' Dewco tube mill



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2—2-2½ ton Mancha battery locomotive
1—2-2½ ton Whitcomb battery locomotive
2—7 ton G. E. permissable battery locomotive
2—8 ton G. E. battery locomotive
4—10 ton Atlas battery locomotive
1—6 ton Goodman trolley locomotive
1—3 ton Whitcomb gas engine driven
1—3 ton Ruth gas engine driven

BLOWERS

1—#8 H Jeffrey 42" aerodyne fan.
1—6½" x 22¾" Roots rotary blower.
1—8½" x 29¼" Roots rotary blower.
1—10" x 18" new Sutorbilt rotary blower.
1—24" x 78" Roots #7 rotary blower.
3—Buffalo #50 steel plate blowers 3840/7650 CFM.
30—American new type H Volume blowers 1200 CFM motor driven.

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2—Dorr type H agitators for 22' diameter x 14' wood tank.
4—8' x 8' Deveroux type agitators.

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ESTABLISHED 1898

MORSE BROS. MACHINERY CO.

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CRUSHERS, JAW: Various makes, 3" x 5" to 48" x 60".

CRUSHERS, REDUCTION: Symons 2 ft. standard bowl, Telsmith 2 ft. and 3 ft. Gyrasphere, Traylor 4 ft., type TY.

DRAG SCRAPERS, CRESCENT BUCKETS: 1—Sauerman 2 yd. Drag Scraper outfit complete, without 75 H.P. motor. 1—Sauerman ¾ yd. capacity complete with motor 1—Sauerman 1 yd. capacity, complete with diesel motor.

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CAR PULLER: Lidgerwood single drum, 5 H.P., 440 volt, slip ring motor and controls.

NODULIZER, 1—8'6"-10'0"-8'6" dia. 50 ft. long.

COMPRESSOR: Worthington 2 stage, 29 - 23 x 21, 600 H.P. synchronous motor, 3 phase, 60 cycle, 2200 or 440 volt, 180 RPM, 100 lbs. pressure, complete with all auxiliary equipment. In operation now, available immediately.

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Jeffrey-Traylor, type 4JT 155.
Allis-Chalmers, Electro Magnetic, "Utah".
Syntron V200

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4' x 60' x 7/16" shell.
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1,150 gal. 54"x9'x5/16", ⅜" heads (2).
1,600 gal. 8'x7'x3/16" cone bottom (2).
2,100 gal. 9'x6'6"x3/16" cone bottom (2).
2,300 gal. 5'x17'x¼" SS.
3,000 gal. 5'x21'x¼", type 430 SS.
6,500 gal. 76" ID, 27'10" overall, 11/16" & 5/16" shell, 5/16" heads (40).
9,600 gal. 11'x13'9"x⅜" (NEW).
13,500 gal. 10'x21'6"x1".
15,300 gal. 9'x32'x5/16".
16,200 gal. 10'6" x 25' x ¼".

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3,500 gal. 5'x24'x¾" 225 PSI (5).
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12"	4	1/16"	1/32"	28 Oz.
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16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
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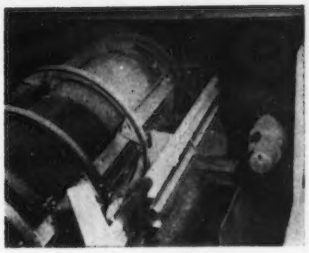

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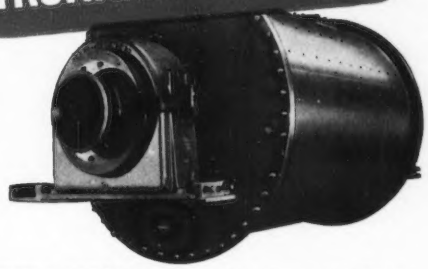
Engineered for *Grinding Mills*

ALLIS-CHALMERS

TRUNNION BEARING



EXTRA LARGE — Diameter of king-size Allis-Chalmers trunnion bearing is almost twice the bearing length, large enough to permit spout feeding. Large bearing proportions will provide long service despite heavy-going demands on mill. Internal oil system can be checked visually by means of hinged flap on bearing housing.

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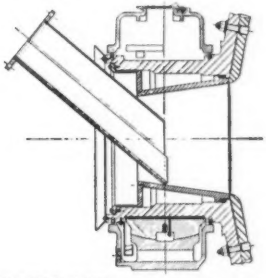

LONG BEARING LIFE — Internal oiling buckets carry lubricant to oiling pan. Oil is supplied the instant mill is started. All large bearings are fitted with lubricant pump for floating the mill during starting. This overcomes high starting torques and eliminates "dry" starting after shut-downs, which causes about 75 percent of bearing wear.

During normal operation, a film of lubricant separates trunnion from bearing. No metal to metal contact.

After a short shut-down period the thickness of this protecting film of lubricant is reduced.

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Lubricant pump floats the mill before starting . . . re-establishes protecting film of oil. Power needed for starting is greatly reduced, too.

Additional facts about trunnion bearings and other modern features of Allis-Chalmers grinding mills may be obtained without obligation from the A-C representative in your area or by writing to: Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3348

Texrope is an Allis-Chalmers trademark.

Trunnion bearings are built by Allis-Chalmers in 10 sizes from 14 x 8 to 54 x 22-in. The six smallest sizes are available as grease lubricated bearings; seven largest sizes as oil lubricated bearings.

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